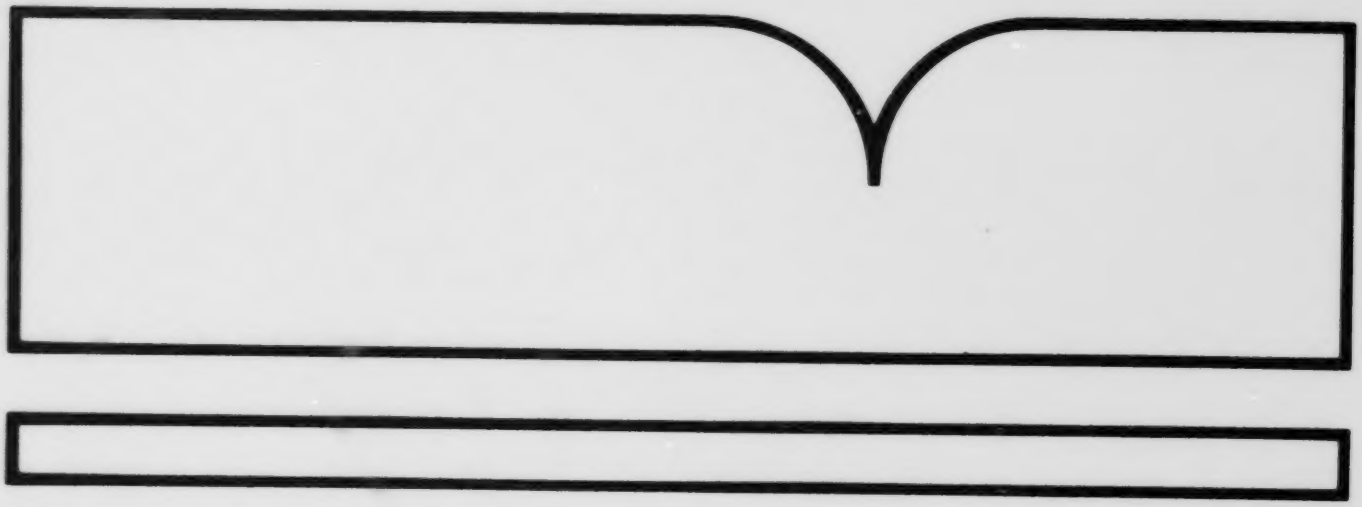
PB88-126495

Superfund Record of Decision (EPA Region 4)
Tower Chemical Company Site
Clermont, Florida, July 1987

(U.S.) Environmental Protection Agency
Washington, DC

9 Jul 87



U.S. Department of Commerce
National Technical Information Service
NTIS

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
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16. ABSTRACT

The Tower Chemical Company (TCC) site is an abandoned manufacturing facility located along the eastern edge of Lake County, Florida. The TCC owned and utilized two separate parcels of land: a main facility and a spray irrigation field approximately 16 residences, located within a 1.2 mile radius of the site, tap the underlying aquifer for their water supply. Wetlands and swamps are also nearby the site. From 1957 to 1981, the TCC manufactured, formulated and stored various pesticides, acidic wastewaters, produced during the manufacturing process were discharged into the unlined percolation/evaporation pond located at the main facility. In July 1980, the pond overflowed and discharge was diverted to the spray irrigation field. In June 1980, as a result of damages caused by the wastewater pond overflow, the Florida Department of Environmental Regulation (FDER) ordered TCC to cease all discharges from the site studies, initiated by both EPA and FDER, indicated high concentrations of DDT and associated pesticide compounds in the main facility and a below normal fish population in the unnamed stream onsite. In April 1983, the Centers for Disease Control (CDC) recommended site stabilization and access restriction to the main facility/disposal areas. In July 1983, an IRM was initiated. It included: excavation of 2,275 sq. ft. of soil, 1,545 cu. yds. of sediment and 72 drums with offsite disposal, wastewater pump and treatment of approximately 1,000,000 gallons with discharge to the unnamed stream; (See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Tower Chemical, FL Contaminated Media: gw, sw Key contaminants: DDT, pesticides, metals		

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EPA/ROD/R04-87/022
Tower Chemical, FL

16. ABSTRACT (continued)

backfilling, capping, surface water runoff diversion system, and fencing. Currently, soil and ground water are contaminated with DDT, pesticides and metals.

The selected remedial action includes: removal and onsite treatment of approxiamtely 100,000,000 gallons contaminated ground water with temporary onsite storage followed by discharge to surface water; provision of individual treatment units for two private wells within the immediate site vicinity, excavation and incineration of approximately 4,000 cu. yds. of contamianted surface soils from both the overflow area and portions of the burn/burial area of the site; analysis of the treated soils to determine the proper action for residual management; exploration of the burn/burial area to determine the source of a magnetic anomaly. If relic drums are identified, the contents will be typed and disposed of by thermal destruction; decontamination of two storage tanks and nearby concrete pads; and point source run-off diversion. The estimated capital cost for the remedy is $6,788,000 with no O&M costs.

PB88-126495

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-87/022
July 1987

EPA

Superfund Record of Decision:

TOWER CHEMICAL, FL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

DECLARATION FOR THE RECORD OF DECISION

Tower Chemical Company Site
Clermont, Florida

STATEMENT OF PURPOSE

This decision document represents the selected remedial action for the Tower Chemical Company site which was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP).

The State of Florida has concurred with the selected remedy and has agreed to provide funding for 10% of the Remedial Action cost which is estimated to be $6.8 million.

STATEMENT OF BASIS

This decision is based on the administrative record which is on file in the EPA Region IV offices, 345 Courtland Street, Atlanta, GA or is available at the Cooper Memorial Library, 620 West Montrose Street, Clermont, Florida. The attached index identifies the documents which comprise the administrative record upon which the selection of a remedial action is based.

DESCRIPTION OF THE SELECTED REMEDY

Groundwater recovery operations will be conducted to remove all groundwater which contains contamination in excess of the criteria presented in Section VIII of the Summary of Remedial Alternative Selection. Recovered groundwater will be treated in an on-site treatment facility. Treated groundwater will be stored on-site until analytical results confirm that the effluent meets the established clean-up criteria. Disposal will be via surface water discharge. Groundwater recovery operations will be considered as part of the Remedial Action for 10 years from inception or until the groundwater clean-up goals are reached; whichever occurs first. If the groundwater recovery system is still operating after 10 years, the efficiency of the groundwater recovery system will be re-evaluated.

Individual treatment units will be provided for the two active wells within the immediate site vicinity: one owned by Mr. and Mrs. Charles Hubbard and one owned by Classic Manufacturing Inc. which provides potable water to the employees of Vita-Green, Inc. EPA will maintain the units until the groundwater recovery is complete.

Surface soil removal will be conducted in the overflow area of the former waste water pond, the burn/burial area, around the storage tanks, and all soils which have contaminant concentrations in excess of the clean-up criteria established in Section VIII of the Summary of Remedial Action Selection. This will be approximately 4,000 cubic yards.

Excavated soils will be treated on-site by thermal destruction of the contaminants. Thermally treated soils will be analyzed after the test burn to determine the proper action for residual management. Exploration of the burn/burial area to determine the source of a magnetic anomaly will be conducted in conjunction with the soil removal program. If relic drums are identified, the contents will be typed and disposed of by thermal destruction. In addition, two storage tanks and nearby concrete pads from the Tower Chemical Co. operations will be decontaminated. Any sludges from the tanks will be thermally destroyed and wash down fluids will be treated in the on-site treatment facility. The decontaminated tanks will be recycled and the concrete pads will be backfilled with the treated soils.

Point source run-off diversion will divert run-off from the main building roof and the wash down waters for the Vita-Green Company to reduce erosion of the soils. All areas affected by implementation of the selected remedy will be regraded and revegetated to enhance soil stability.

Operation and maintenance activities will be limited to verification of the completeness of the Remedial Action since all site contaminants will be destroyed.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Lee G. Dickinson, Acting

Jack E. Ravan
Regional Administrator

July 9, 1987
Date

ATTENTION

AS NOTED IN THE NTIS ANNOUNCEMENT, PORTIONS OF THIS REPORT ARE NOT LEGIBLE. HOWEVER, IT IS THE BEST REPRODUCTION AVAILABLE FROM THE COPY SENT TO NTIS.

Tower Chemical Company Site
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Remedial Investigation Volume II Final

Remedial Investigation Site Operation Plan

Remedial Investigation/Feasibility Study Work Plan

Removal Action Report

Responsiveness Summary

Risk Assessment

Soil Technologies Letter Report

As of 6/24/87

SECTION I
SITE LOCATION AND DESCRIPTION

The Tower Chemical Company (Tower) NPL Site is located on County Road 455 along the eastern edge of Lake County, Florida. The site is 3.8 miles east of Clermont, Florida and 15 miles west of Orlando, Florida (Figure 1). The Tower site is an abandoned facility which manufactured various pesticides from 1957 to 1981.

The Tower Chemical Company owned and utilized two separate parcels of land during the time the company was in operation: a main facility and a spray irrigation field.

The main facility (Figure 2) consisted of a production building, a small utility building, an office, and two disposal areas: a burn/burial area for solid wastes and a percolation/evaporation pond for acidic wastewaters.

The spray irrigation field covers approximately seven acres and consists of four parallel strips of land (Figure 3). A series of spray beds were used in 1980 for discharging process wastewaters.

The site is relatively flat across the main facility with only about 5 feet of relief. The spray irrigation field shows about 20 feet of relief, descending from south to north. Both portions of the site drain into swampy areas which eventually drain into an unnamed stream north of the site, which in turn, drains into the Gourd Neck area of Lake Apopka. The lake and nearby swamps and wetlands provide an important natural habitat for local wildlife, including nesting bald eagles.

Within a 1.2 mile radius of the site, land use consists of agricultural lands (48%), lakes and wetlands (31%), range land and forest (9%), extraction/transitional lands (7%), residential property (less than 3%), and commercial/industrial land (less than 2%).

Locally there is no central water supply; thus, approximately 16 local households (60 consumers) rely on private wells which tap the Floridan Aquifer for their water supply. Within the site area, no surface water resources are used for drinking water supplies, but Lake Apopka is used for recreational purposes.

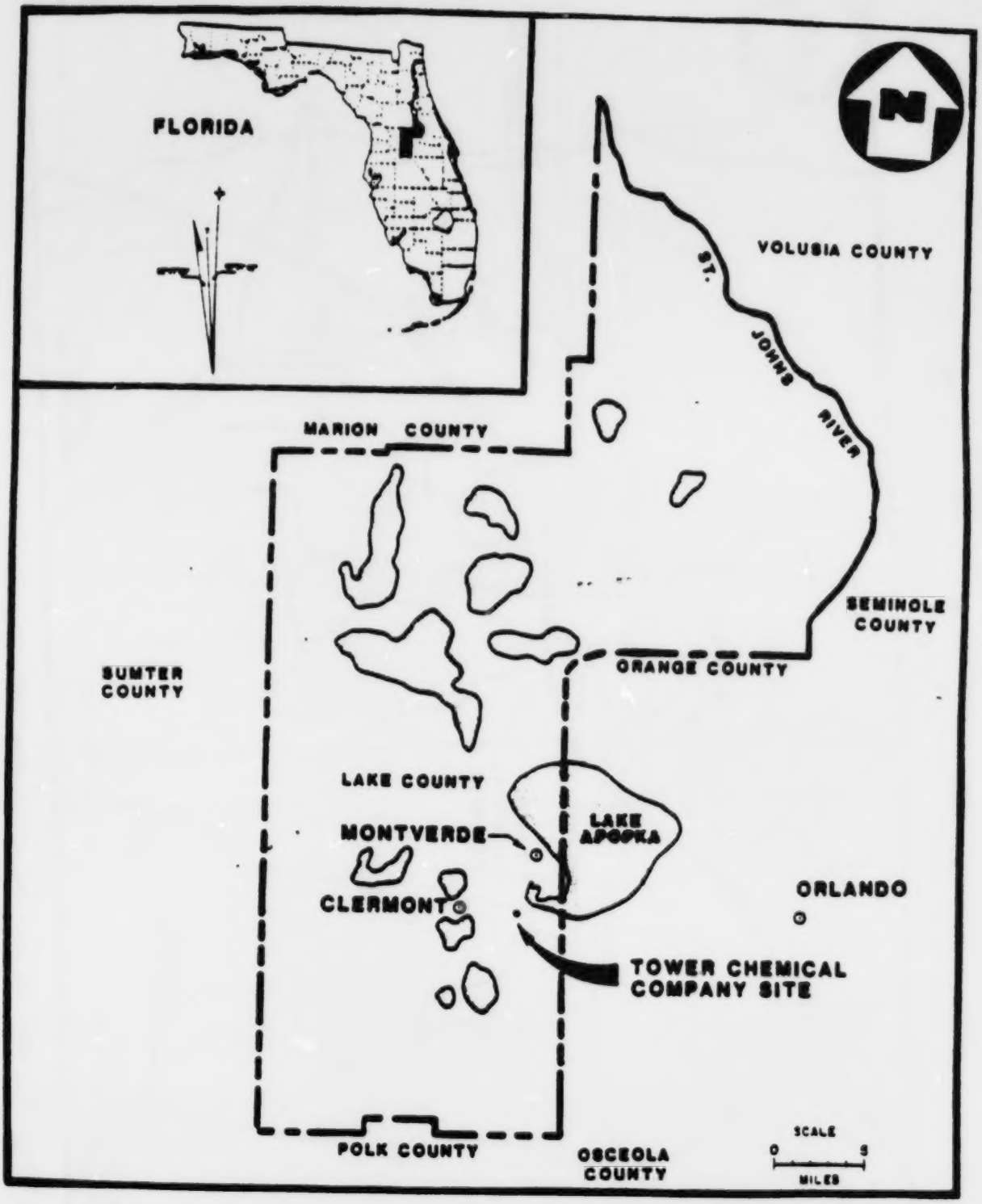

Figure 1A - Site Location Map, Tower Chemical Company Site.

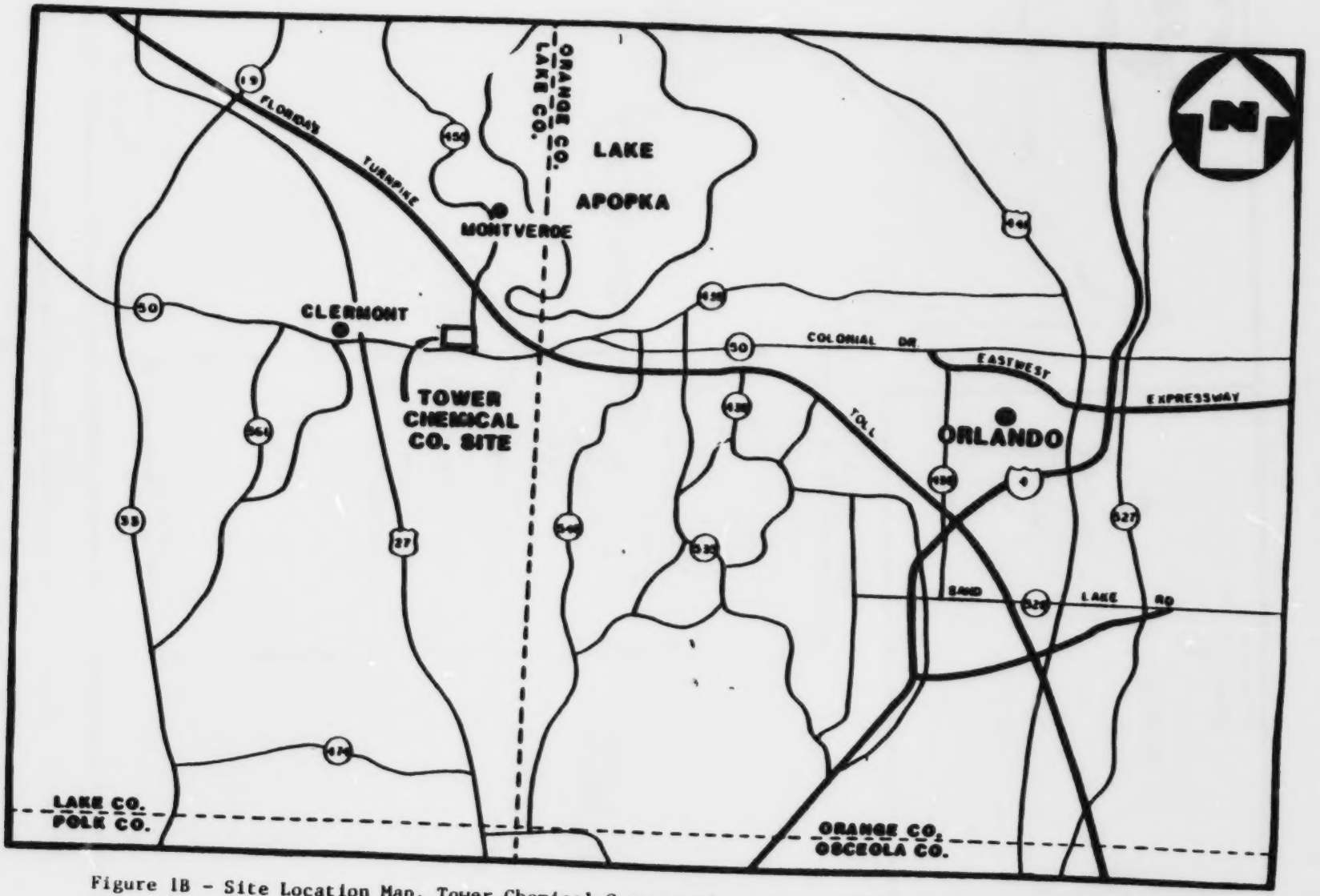

Figure 1B - Site Location Map, Tower Chemical Company Site.

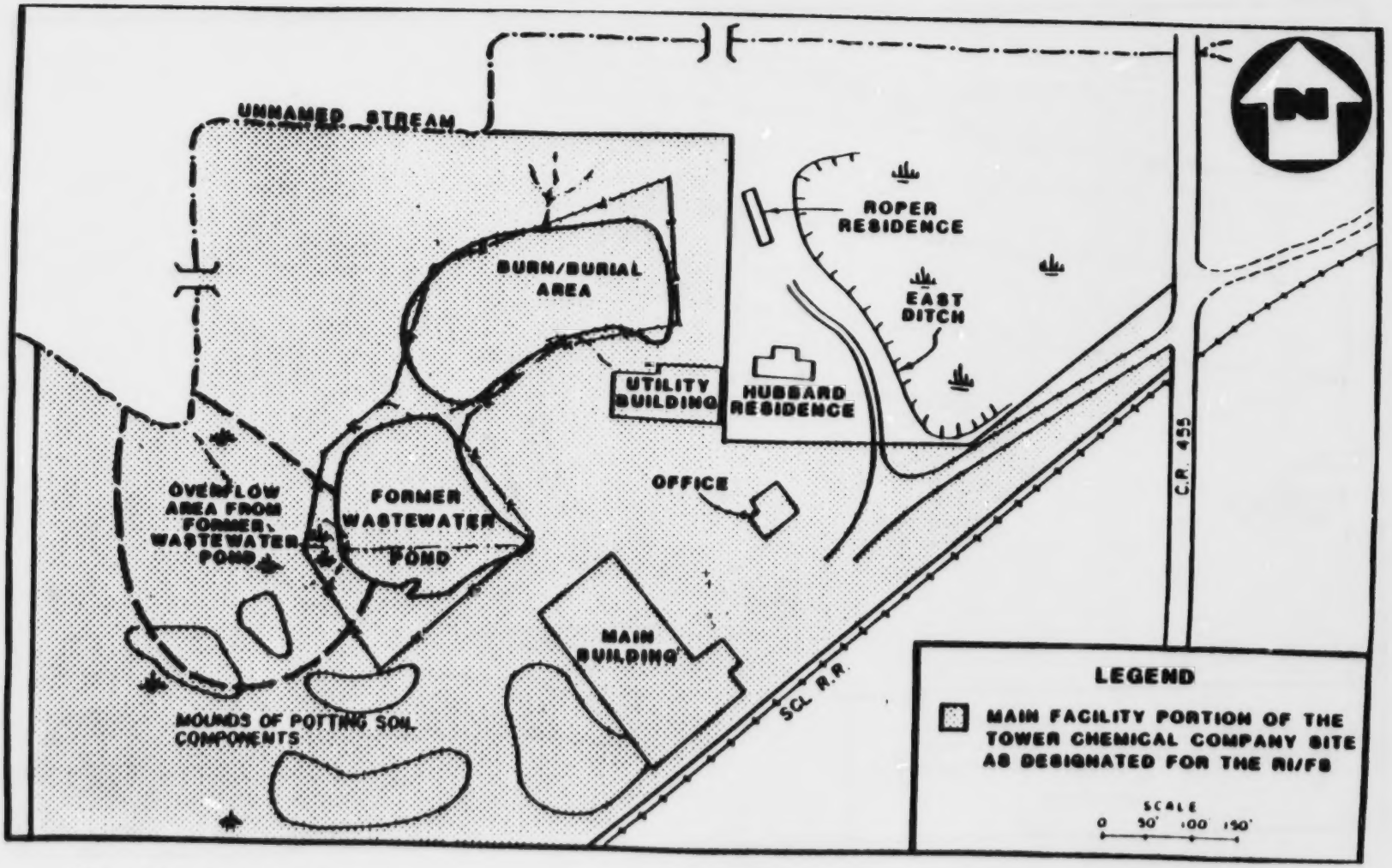

Figure 2 - Detailed Site Map, Main Facility.

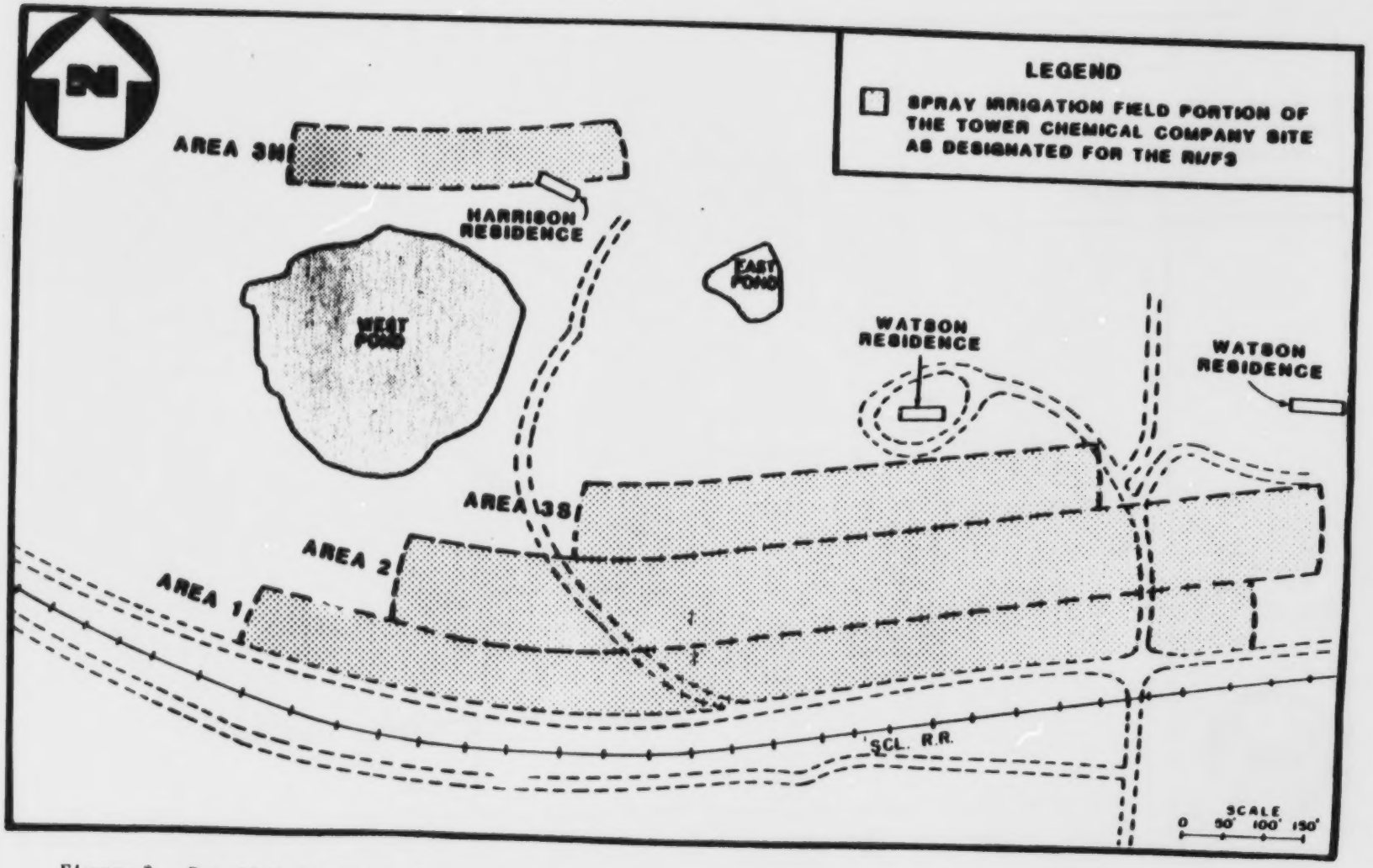

Figure 3 - Detailed Site Map, Spray Irrigation Field.

SECTION II
SITE HISTORY

OPERATIONAL HISTORY

From 1957 to 1981, the Tower Chemical Company manufactured, formulated, and stored various pesticides. The two main products produced by Tower were chlorobenzilate (a miticide) and a copper-based agricultural fungicide with the trade name "Cop-o-cide". In order to produce chlorobenzilate it was necessary to either buy or manufacture the compound dichlorobenzil. During periods in which dichlorobenzil was difficult to obtain, the Tower Chemical company manufactured it in-house from dichloro-diphenyl-trichloroethane (DDT). This operation was used during the last few months of the Company's operation.

Acidic wastewaters were produced during the manufacturing process. Originally, these wastewaters were discharged into the unlined percolation/evaporation pond located at the main facility. In July 1980, the spray irrigation field was operational and was being used for discharge of the acidic wastewaters. The spray irrigation field was used because the percolation/evaporation pond was full, and in fact did overflow its banks during July 1980.

The burn/burial area had historically been used as a burning ground for disposal of the company's solid chemical wastes and for burial of solid wastes. The buried wastes were both drummed and undrummed wastes.

As a result of the percolation/evaporation pond overflow, the Florida Department of Environmental Regulation (FDER) and the U.S. Environmental Protection Agency (EPA), initiated site investigations in early 1981. In December 1981 all production operations were stopped at the Tower Chemical Company and the facility was decommissioned during 1981.

In 1981, prior to the decommissioning, the warrenty deed for the property owned by the Tower Chemical Company Plant was transferred to James E. Gallagher, as trustee and the spray irrigation field was sold to O.T. Enterprises.

After closure of the Tower Chemical Company, two new businesses were opened on the main facility: Classic Manufacturing Company and Vita-Green Inc. From 1981 to 1986, Classic Manufacturing used about 1 acre of the main facility for the manufacture of plastic worm fishing lures. During the summer of 1986, Classic Manufacturing moved to a new location off-site although Classic still holds the property deed. After leasing an other portion of the property, Vita-Green, Inc. moved onto the site in September 1981. This company blends potting soils and packages it for home garden use. Vita-Green is still actively operating on the western portion of the main facility.

The area used for the eastern portion of the spray irrigation field was bought jointly in the early 1980's by Ms. Mabel Watson and Mr. William Watson, Jr. Both owners now live on the property and use the land for cattle and goat grazing as well as sugar cane cultivation. The western portion was purchased by Mr. Ben Harrison who has built his home on the property and used most of the land to establish a wholesale nursery.

None of the activities subsequent to the Tower Chemical Company operations have significantly impacted the site.

PERMIT AND REGULATORY HISTORY

The permit and regulatory history began in July 1979, when the Tower Chemical Company applied for a National Pollutant Discharge Elimination System (NPDES) permit, followed in November 1979, by an application to construct an industrial wastewater treatment and disposal system. These applications referred to occasional discharge of wastewater into the unnamed stream at times of flooding and to the construction of the spray irrigation field. The EPA did not issue the NPDES permit, but the FDER did grant a Permit to Construct for the spray irrigation system. The conditions of the construction permit included an initial period of operation for appropriate testing to determine compliance with the permit conditions. The permit required the installation of monitoring wells before use of the area as a disposal site to determine background water quality. Groundwater monitoring every six months after operational start-up was also a condition of the permit.

As a result of the damages caused by the wastewater pond overflow, on June 5, 1980, FDER ordered Tower Chemical Company to cease all discharges from the site. The Tower Chemical Company responded to the order and assured FDER of compliance. In July 1980, the State Circuit Court ruled that the Tower Chemical Company could continue to operate only if the company met the FDER requirements. From this point, Tower Chemical Company and FDER entered into negotiations to define the clean-up process for the site. Meanwhile, FDER pursued legal action against the Tower Chemical Company and its president, Mr. Ralph Roane.

In August 1980, EPA conducted a preliminary hazardous waste site investigation of the Tower Chemical Company site. The site received a Hazardous Ranking System (HRS) score of 44.03 (Appendix A). As a result of the HRS score, the Tower Chemical Company site was proposed for inclusion on the National Priorities List of Hazardous Waste Sites (NPL) in October 1981. The site was finalized on the NPL in December 1982.

On June 15, 1982, FDER, Tower Chemical Company, and Mr. Ralph Roane agreed to the entry of a Consent Final Judgement in which Tower Chemical Company was to pay compensatory damages in the amount of $10,000,000 and Mr. Roane was to pay $40,000.

In development of a clean-up plan, EPA provided input to FDER regarding the need to prepare a feasibility study (FS) to develop a range of remedial alternatives. The Tower Chemical Company agreed to prepare an FS. Interactions occurred over a period of about one year among EPA, FDER, and Tower Chemical Company, but the FS was not developed. In February 1983, FDER considered filing for contempt of court because neither the company nor Mr. Roane had paid the court-ordered judgements. Instead of taking further legal action, FDER requested that EPA acquire the management role for the remedial planning process for the Tower site.

In March 1984, EPA tasked NUS Corporation, under the original REM-FIT contract, to conduct a Remedial Investigation and Feasibility Study (RI/FS) for this site.

A public meeting was held on September 16, 1986, to present the draft Remedial Investigation report and the draft Feasibility Study. The public meeting was the initiation of a public comment period which closed on October 7, 1986. Each comment received during the public comment period was addressed in the Responsiveness Summary (Appendix B).

PREVIOUS STUDIES

As a result of the 1980 wastewater pond overflow incident, both EPA and FDER initiated separate studies of the Tower site. The FDER found that water with a low pH extended from the overflow area to Lake Apopka. In August 1980, the Florida Game and Fresh Water Fish Commission conducted a study of the unnamed stream and Lake Apopka. Their results indicated that the fish population in the stream was below normal.

On August 12, 1980, EPA Region IV Environmental Services Division (ESD) conducted a site sampling investigation which included the main facility disposal areas, the unnamed stream, four private wells, and the spray irrigation field. High concentrations of DDT and associated pesticide compounds were found in samples collected from the main facility waste disposal areas. The stream was determined to have been affected by chemicals from the Tower site. Of the four wells sampled, one organic compound was identified in a sample from one well, but EPA suspected that this compound was the result of laboratory contamination. Some pesticide compounds were also identified in soil samples from the spray irrigation field. In February 1981, three of the four residential wells were resampled and the analytical results revealed no presence of organic compounds.

In 1981, FDER collected samples from the spray irrigation field and the main facility disposal areas. The soils at the spray irrigation field were found to be contaminated by pesticides primarily within the upper foot of soil. Higher levels of pesticide contamination were identified at the burn/burial area and at greater depths. A geophysical survey was also performed at the main facility as part of the FDER study. The report issued by FDER indicated a possible groundwater contamination problem caused

by mounding effect of the ground water beneath the former wastewater pond. EPA's Contractor, NUS Corp. recommended further hydrogeological investigation with the concern focusing on a possible hydraulic connection between the surficial and Floridan aquifers.

In 1982, FDER collected several ground water samples from temporary sandpoint wells set just below the water table. These analytical results indicated the presence of DDT and dicofol in the ground water. Later the same year, the FIT contractor for EPA (Ecology & Environment, Inc.) attempted a geophysical survey at the site with limited success, presumably due to very dry soil conditions.

Also in 1982, EPA/ESD conducted an ambient air sampling investigation to support the site's HRS score. The Tower Chemical Company was not in operation at the time of the study. The results of the investigation indicated that there was not an ambient air quality problem in the vicinity of the main facility.

In April 1983, the Centers for Disease Control (CDC) recommended site stabilization and access restriction to the main facility disposal areas. This recommendation lead to the authorization and implementation of an immediate removal measure in July 1983. Following the removal activites, a Remedial Action Master Plan (RAMP), was developed for the site but the RAMP itself did not entail field work.

PREVIOUS SITE RESPONSE ACTIONS

Following the closure of the Tower Chemical Company, FDER requested assistance from EPA to implement remedial action at the site. The main facility was further sampled and an immediate removal measure (IRM) was conducted by EPA in July 1983. FDER maintained the lead authority for the removal work necessary at the spray irrigation field. Descriptions of the IRMs follow.

Main Facility IRM: The Centers for Disease Control Agency for Toxic Substance and Disease Registry (CDC/ATSDR) determined that a potential threat to public health existed at the Tower site due to the potential for exposure to wastes in the main facility area. Field studies identified a 2,275 square foot area that comprised the burn/burial area. This area was excavated to an average depth of 8 feet, where previously elevated levels of pesticides diminished. At a depth of 5 feet, approximately 70 empty drums and 2 partially filled drums were unearthed. All of these excavated materials were shipped to the Chemical Waste Management facility in Emille, Alabama for disposal.

Simultaneous with the excavation activities, water was pumped from the percolation/evaporation pond. The wastewater was treated on-site to levels which complied with existing laws by use of an activated carbon filter and pH adjustment.

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The treated wastewater, which had been verifed for release, was discharged into the unnamed stream north of the site, and thereby into Lake Apopka. Approximately 1,000,000 gallons of contaminated water were treated and discharged. Once the water level in the percolation/evaporation pond was lowered sufficently, excavation of the contaminated sediments began. The sediments were dewatered and bulked with the excavated soils before being shipped to Emille, Alabama. Approximately 1,545 cubic yards of contaminated sediments were removed from the site.

After the removal activity was completed, both the burn/burial area and the pond were backfilled with clean fill material. The excavated portion of the burn/burial area was covered with a clay cap. A surface water run-off diversion system was installed to reduce the amount of precipitation which could percolate through the former pond area. Finally, a chain link fence with a locking gate was erected around the perimeter of the two disposal areas.

Spray Irrigation Field IRM: In 1981, FDER ordered O.T. Enterprises, the property owner, to clean-up the spray irrigation field. This clean-up was to consist of removal of the contaminated soils around each sprayhead and disassembly of the system. The PVC lines and sprayheads were removed and approximately 1.5 feet of soil were removed from the defoliated areas surrounding each sprayhead. This soil reportedly was placed on the west side of the west pond. The remaining soil was then tilled and limed. Other reports suggest that the spray irrigation field was disced and limed only, and that no soil was removed (Hubbard, 1984). With this uncertainty, the spray irrigation field was addressed as part of the RI/FS.

SECTION III
CURRENT SITE STATUS

The physical characteristics of the Tower Chemical Company site were evaluated during the Remedial Investigation (RI) process. As a result of the RI field study the current status of the site has been well defined. In order to understand the current site conditions it is necessary to know what compounds were historically used on the site. This information is presented in Appendix C.

SOILS

Main Facility Soils

The soil samples collected in the area of the main facility were obtained from both surface and subsurface sampling points from five areas which were defined by drainage pathways (Figure 4). The five areas are:

- The east drainage field
- The north burn/burial drainage area
- The south burn/burial drainage area
- The former pond overflow area, and
- The main building drainage area

Surface soil sample locations are shown in Figure 5. The locations of subsurface soil samples collected at depths of 2 feet are shown in Figure 6 and those collected at depths of 7 feet are shown in Figure 7.

Analysis of the surface soil samples indicated that the compounds listed in Table 1 were present in significant quanitities compared to the background samples. The compounds identified in these analyses are reflective of the known historical operations at the Tower Chemical Company site. The analytical results of the two-foot and seven-foot subsurface soil samples are shown in Tables 2 and 3 respectively.

The results of the main facility soil sample analyses show that the surface soils throughout the facility are contaminated with 4,4'-DDT and its derivatives, chemicals which are directly associated with the Tower Chemical Company's operation (Figure 8). Specifically, four areas were identified at the main facility that contained significantly elevated concentrations of 4,4'-DDT and its derivatives in comparison to background levels (Figure 9). These four areas are: the storage tank area next to the main building (to depths of less than 1 foot), the overflow area (to depths of less than

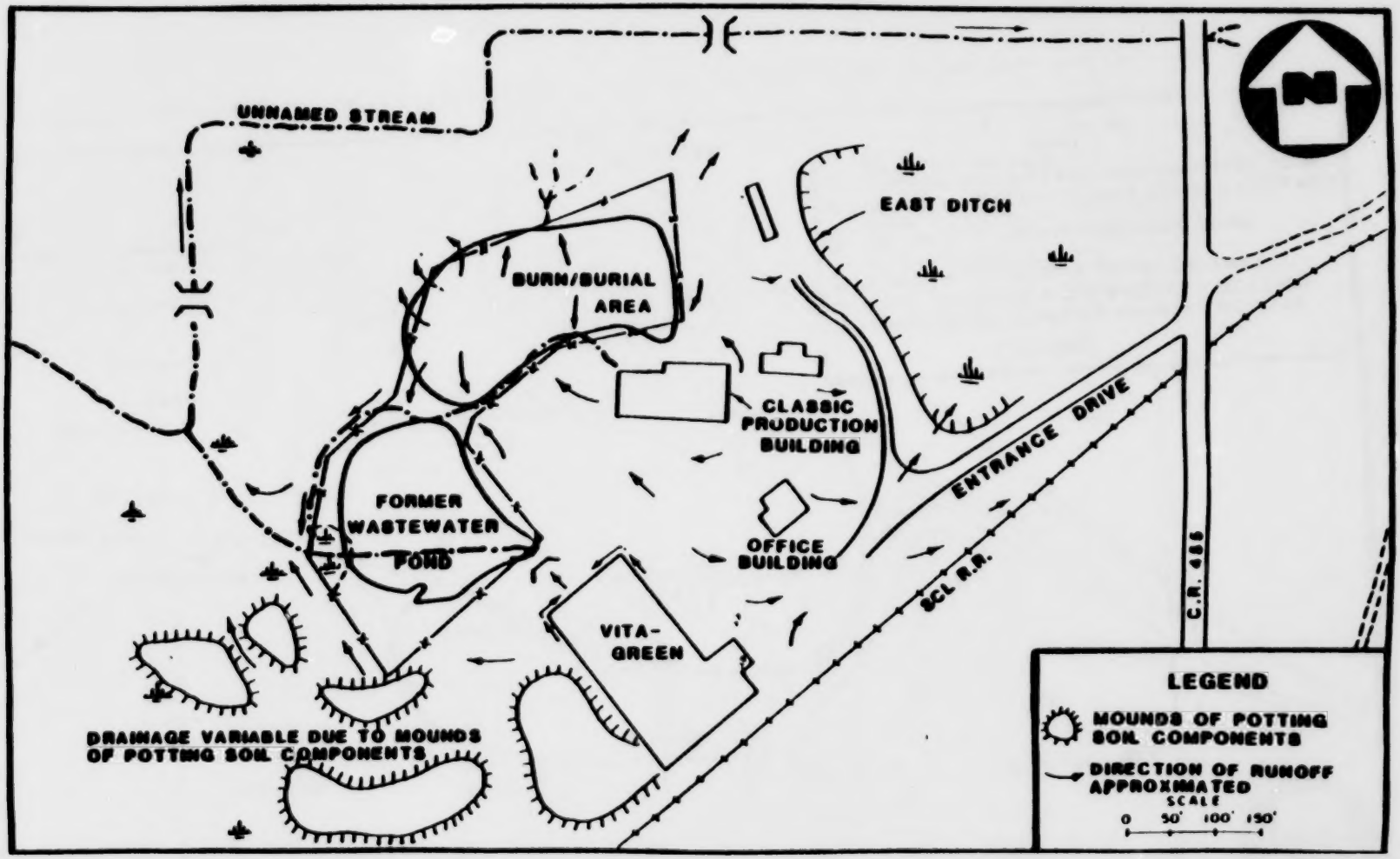

Figure 4 - Surface Water Run-Off Pattern in the Vicinity of the Main Facility, Tower Chemical Company Site.

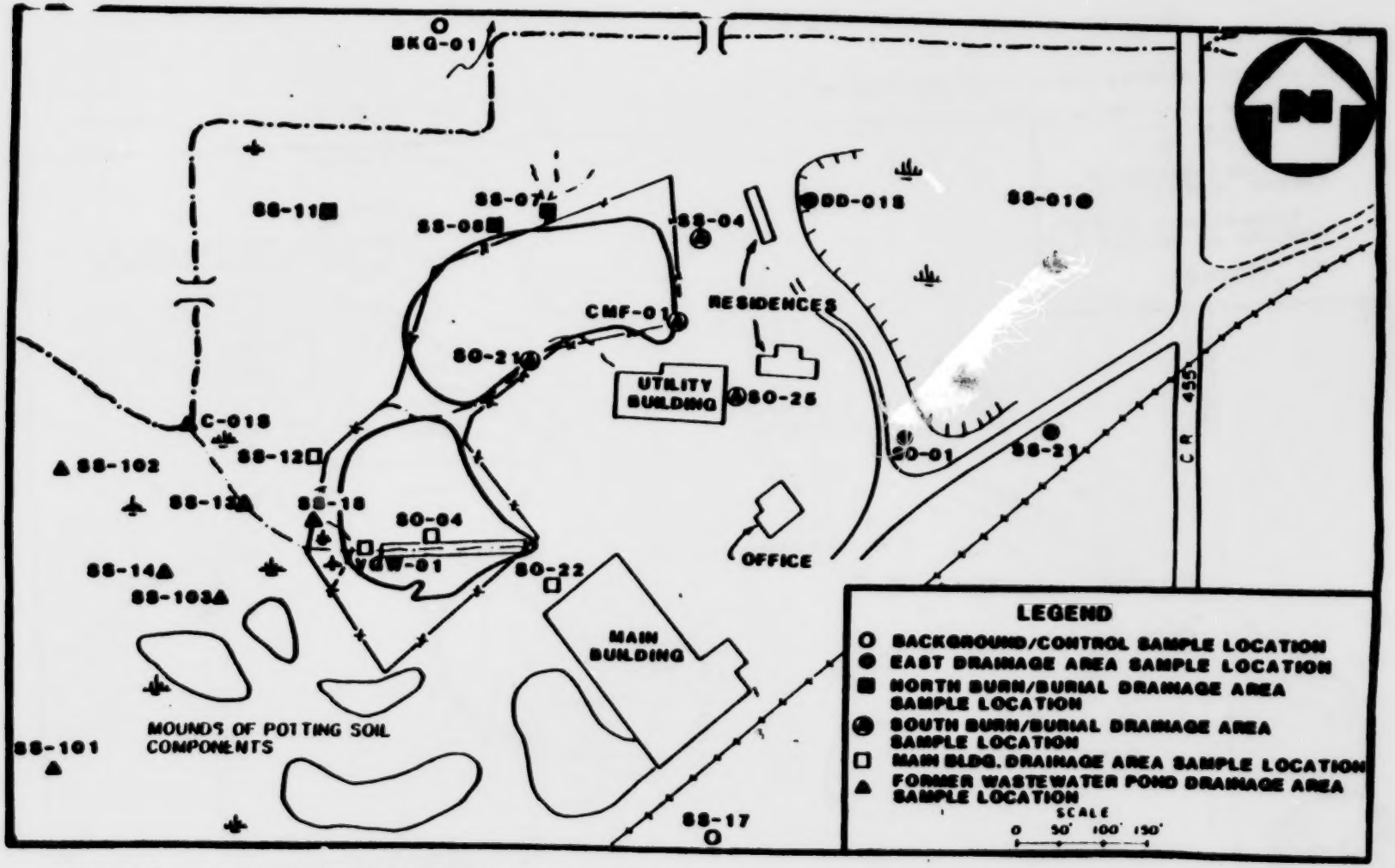

Figure 5 - Surface Soil Sample Locations Use During the Remedial Investigation Main Facility.

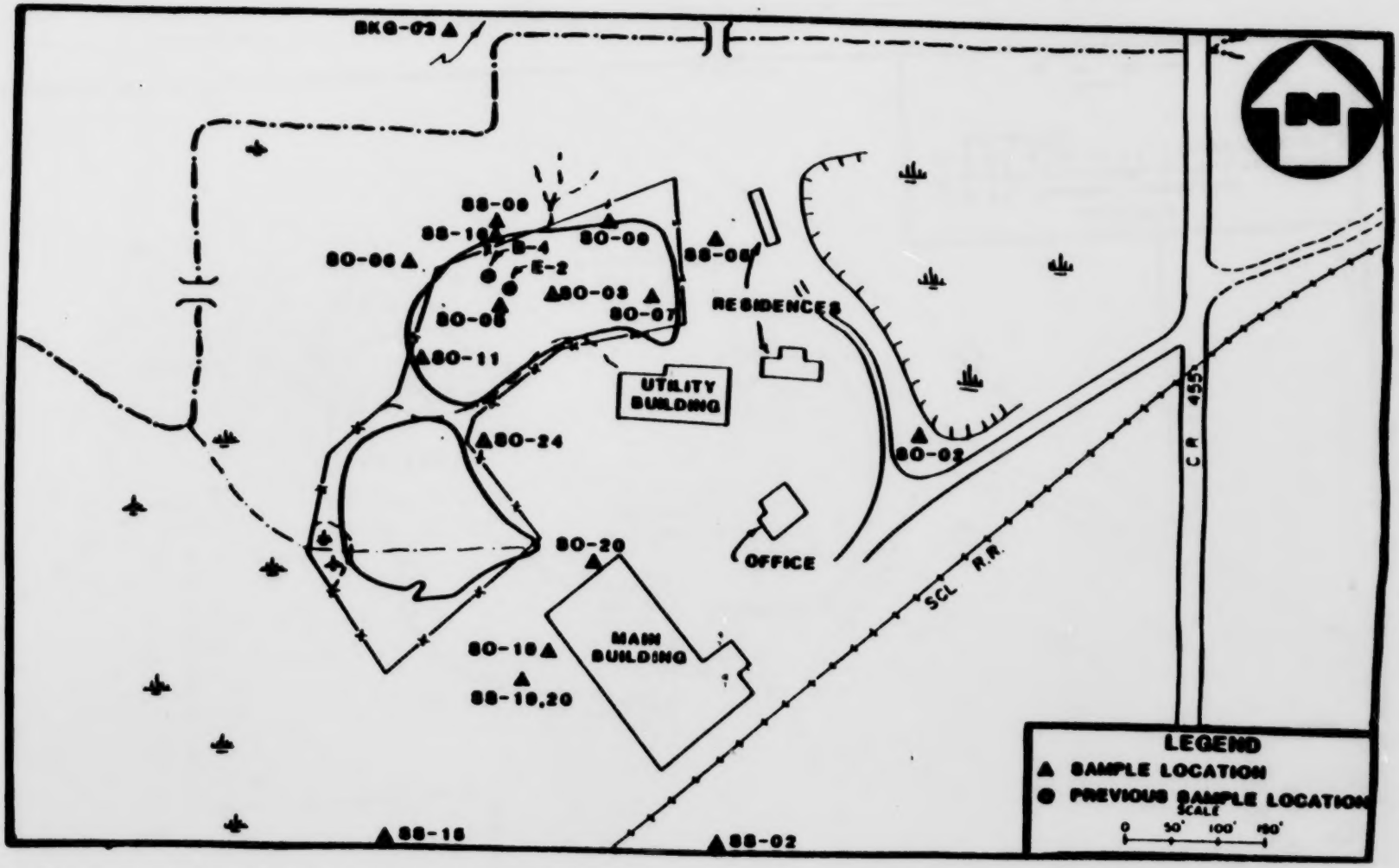

Figure 6 - Subsurface Soil Sample Locations Used in the Remedial Investigation, 2 Foot Depths, Main Facility.

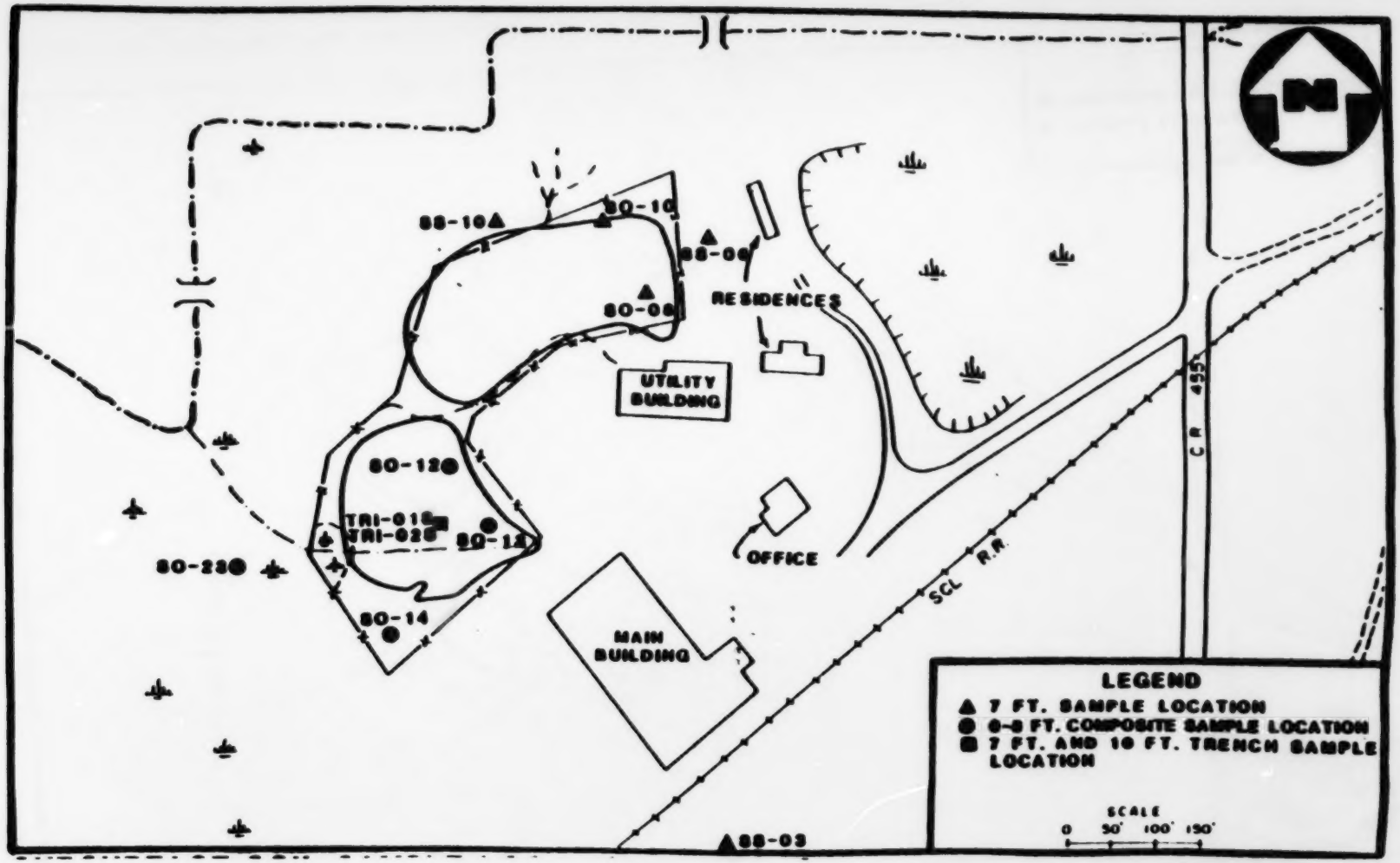

Figure 7 - Subsurface Soil Sample Locations Used During the Remedial Investigation, 7 Foot Depth, Main Facility.

Table 1
Comparison of Selected Contaminants in Surface Soil Samples, Main Facility.

Parameter (ug/kg)	Background	Burn/Burial Area Drainage		Main Building Drainage	Former Pond Drainage
		To the North	To the South		
4,4'-DDT	21	ND-5,200C	ND - 340C	ND-5,600	ND-37,000C
4,4'-DDE	32	ND-4,400C	ND-220C	7.1N - 5,800	150 - 96,000C
4,4'-DDD	-	ND-12,000C	ND-46C	4.9N - 2,400	29J- 30,000JC
Alpha-BHC	-	-	-	-	-
Beta-BHC	-	-	-	-	-
Gamma-BHC	-	-	-	-	-
Delta-BHC	-	-	-	-	-
Ethion	NA	NA	NA	NA	NA
Chlorobenzilate	NA	NA	NA	NA	NA
Dicofol	NA	NA	NA	NA	NA
Xylene	-	NA	-	-	-
Ethyl Benzene	-	NA	-	-	-
Chromium	-	NA	3,000 - 12,000	ND-7,400	ND-6,500
Copper	5,000J	NA	54,000 - 600,000	ND-800,000J	7,000-26,000
Sample Locations	BKG-01	SS-07, SS-08, SS-11	SS-09, SO-21 SO-25, CMF-01	SO-04, SO-22 VGW-01, SS-12	SS-13, SS-14 SS-18, C-015 SS-102, SS-103

- or ND Material analyzed for but not detected.
C Confirmed by GC.
J Estimated value.
N Presumptive evidence of presence of material.
NA Not analyzed.

Table 2
Comparison of Selected Contaminants in Subsurface Soils, 2 Foot Depth, Main Facility.

Parameter (ug/kg)	Control	Burn/Burial Area		Spillage Areas	
		Inside Fence	Outside Fence	Process Area	Entrance Areas
4,4'-DDT	-	1.6N-66,000J	ND-1,400C	ND-0.7J	ND-1,900N
4,4'-DDE	-	ND-4,800J	2J-350C	ND-13	ND-370C
4,4'-DDD	-	ND-14,750J	ND-2,100C	ND-2J	ND-300JN
Alpha-BHC	-	ND-3,430J	ND-5.4JN	-	-
Beta-BHC	-	ND-260	ND-14N	-	-
Gamma-BHC	-	3.5N-1,300	ND-55.7J	-	-
Delta-BHC	-	ND-3,600	ND-4.6J	-	-
Ethion	NA	NA	NA	4,000JN	NA
Chlorobenzilate	NA	NA	NA	NA	NA
Dicofol	NA	NA	NA	NA	NA
Xylene	-	-	-	-	-
Ethyl Benzene	-	-	-	-	-
Chromium	-	ND-11,600J	500	ND-3,600	800
Copper	-	6,000-720,000	27,500J	2,000J-60,000J	4,200
Sample Locations	BKG-02	SO-03, SO-05, SO-07 SO-09, SO-11	SO-06, SS-05 SS-09, SS-16	SO-19, SO-20, SO-21 SS-19, SS-20	SO-02, SS-15

- or ND Material analyzed for but not detected.
N Presumptive evidence of presence of material.
J Estimated value.
C Confirmed by GC.
NA Not analyzed.

Table 3
Comparison of Selected Contaminants from Subsurface Soil Samples - 5,7, and 10 Foot Depths, Main Facility. 1983 valves predate the EPA Removal Action.

Parameter (ug/kg)	1984 7-Ft. Control	Burn/Burial Area		Former Wastewater Pond	
		1983 7-Foot*	1984 7-Foot	1983 5-Foot*	1985 7 & 10 Foot
4,4'-DDT	-	ND - 400	11 - 440C	19,000-3,200,000	2,600 - 11,000
4,4'-DDE	-	ND -19	9.5 - 290C	260,000-14,000,000	16,500JC - 110,000C
4,4'-DDD	-	ND - 67	3J - 880C	26,000-250,000	ND - 2,000
Alpha-BHC	-	NA	-	NA	-
Beta-BHC	-	NA	-	NA	-
Gamma-BHC	-	NA	ND - 26	NA	-
Delta-BHC	-	NA	-	NA	-
Ethion	NA	NA	NA	NA	-
Chlorobenzilate	NA	ND - 362	NA	-	-
Dicofol	NA	NA	NA	NA	300,000J - 390,000
Xylene	NA	NA	-	NA	140 - 1,180J
Ethyl Benzene	NA	NA	-	ND-13	48 - 197J
Chromium	NA	NA	3,000J-4,700	ND-15.5	3,600 - 4,400
Copper	NA	NA	8,300 - 40,000J	ND-340	51,000 - 160,000
Sample Locations	SS-03	A-3, B-2, B-3, C-3	SO-08, SO-10 SS-06, SS-10	E-01, F-01, G-01 H-01, I-01, J-01 K-01, L-01, M-01	TR1-01S, TR1-02S

* 1983 data have been summarized from the EPA ERT cleanup document.
- or ND Material analyzed for but not detected.
C Confirmed by GC.
J Estimated value.
NA Not analyzed.

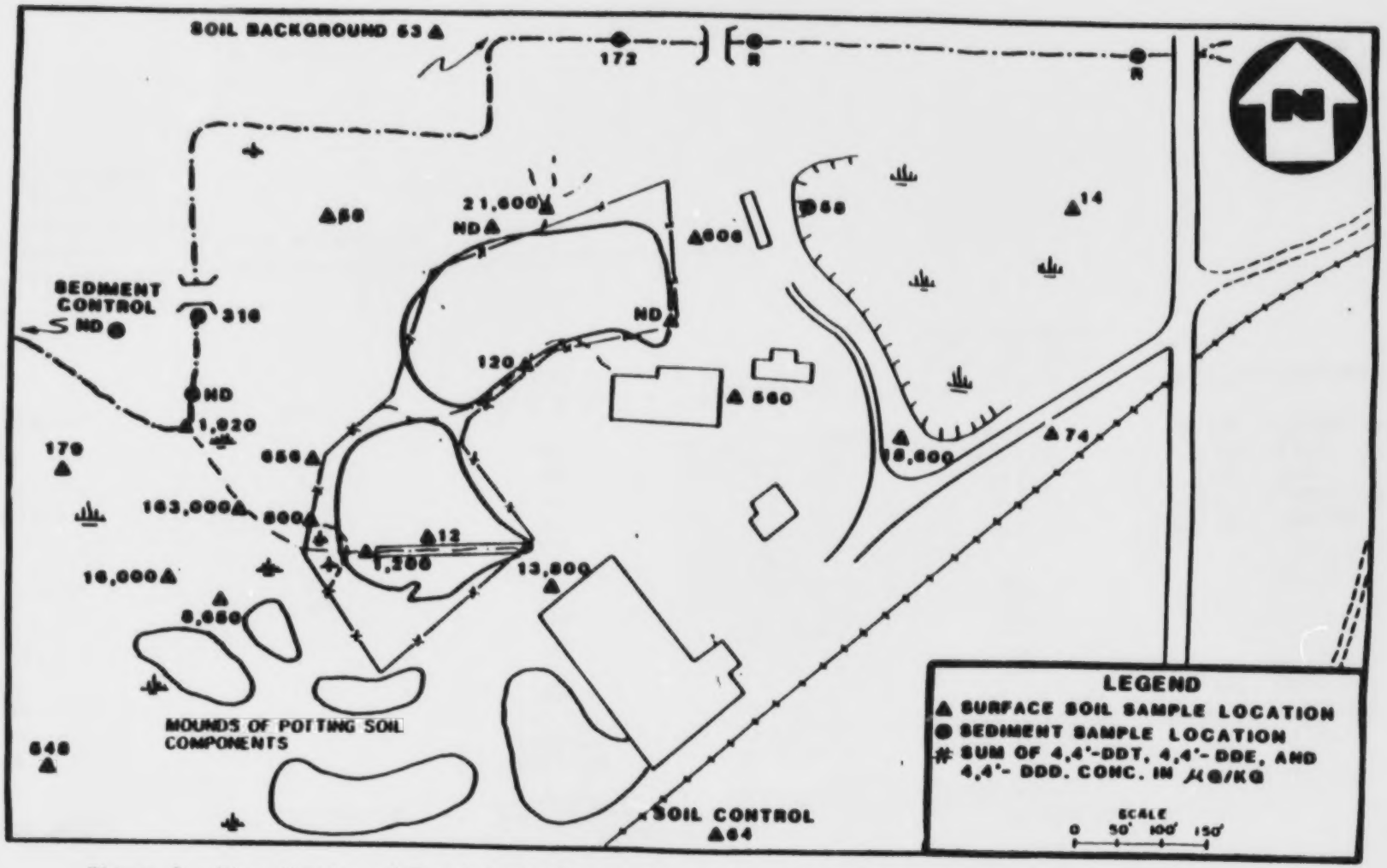

Figure 8 - Distribution of Total 4,4'-DDT and Its Derivatives in Surface Soil and Sediment Samples, Main Facility.

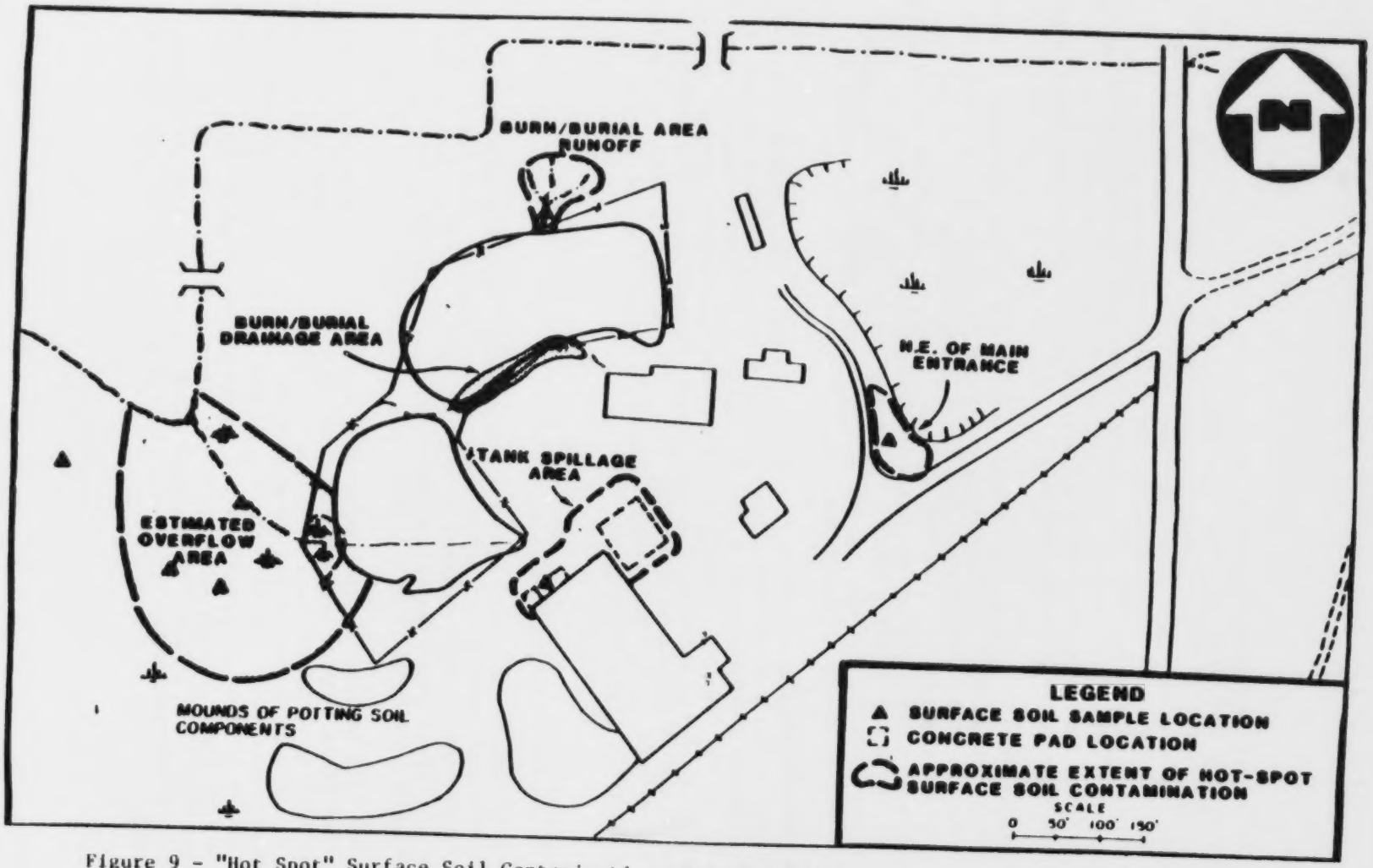

Figure 9 - "Hot Spot" Surface Soil Contamination, Main Facility.

1 foot), the drainage ditch northeast of the burn/burial area (to depths of less than 1 foot), and an area northeast of the entrance drive (to depths of about 3 feet). The drainage area south of the burn/burial area was found to be contaminated with copper as well as other minor constituents. Subsurface soils in the burn/burial and former wastewater pond disposal areas also were found to contain elevated levels of site-related contaminants (Figures 10 and 11). Contaminants in the burn/burial area soils are located in the unsaturated zone while those in the former wastewater pond are already below the water table.

The horizontal extent of contaminated soil in the burn/burial area roughly corresponds with the boundaries shown in Figure 12. Infiltration through the contaminated unsaturated zone appears to be contributing to groundwater contamination of the surficial aquifer. Dispersal of contaminated surface soil was a problem in the past as evidenced by contaminated soils in the receiving drainage areas. Since the former waste disposal areas have been covered, run-off and erosion of contaminated soils appear to currently be only a minor concern.

The overall results of the RI revealed that only a small volume of soils in the main facility area exceed the clean-up criteria specified as part of the selected remedy (Appendix D). The areas which show contamination in excess of the clean-up criteria are along the southwestern portion of the burn/burial area, along the burn/burial area run-off zone, the overflow area of the former waste water pond area, and the tank spillage area adjacent to the main building. The overall volume of these contaminated soils is approximately 4000 cubic yards.

Spray Irrigation Field Soils

The soil samples collected from the spray irrigation field were also collected from surface and subsurface sampling points. The sample collection area consisted of four rectangular strips: Area 1, Area 2, Area 3S, and Area 3N. These four areas are based on the area affected by the four sprayheads used by the Tower Chemical Company for wastewater disposal.

Surface soil samples were collected from the points indicated in Figure 13 and subsurface samples were collected at the points indicated in Figure 14. Subsurface soil samples were collected at depths of 2,3, and 4 feet. Due to the homogeneous nature of the spray effluent, it was feasible to use composite sampling techniques. No surface samples were collected from Area 3N due to the active presence of private regrading operations in which clean planting soils were added in that area during the field effort. An additional composite surface sample was collected along the western boundry of the west pond where excavated sprayfield soils from the FDER IRM were reportedly stored.

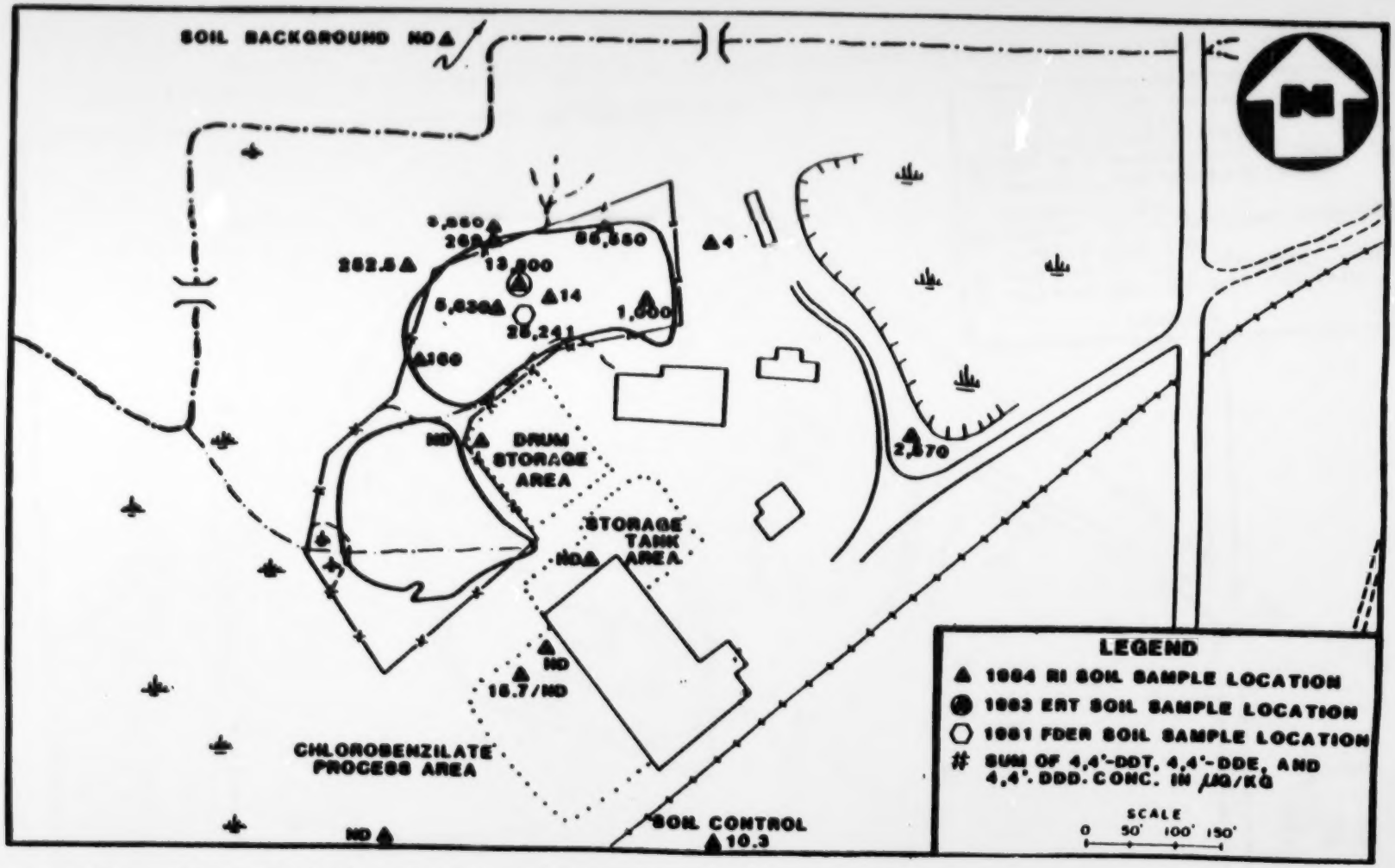

Figure 10 - Distribution of Total 4,4"-DDT and Derivatives in Subsurface Soils, 2 Foot Depths, Main Facility.

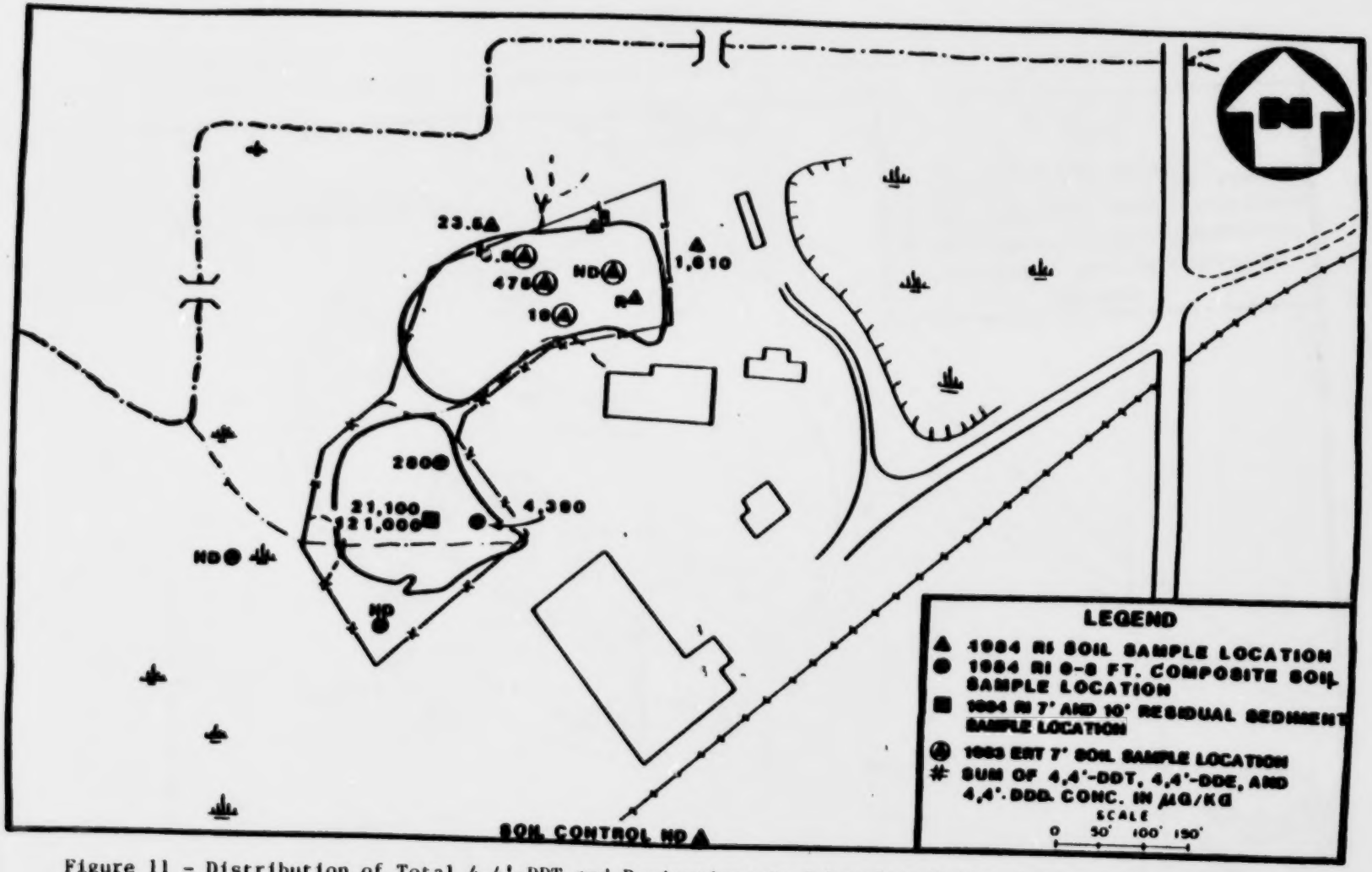

Figure 11 - Distribution of Total 4,4'-DDT and Derivatives in Subsurface Soils, 7 Foot Depths. Main Facility.

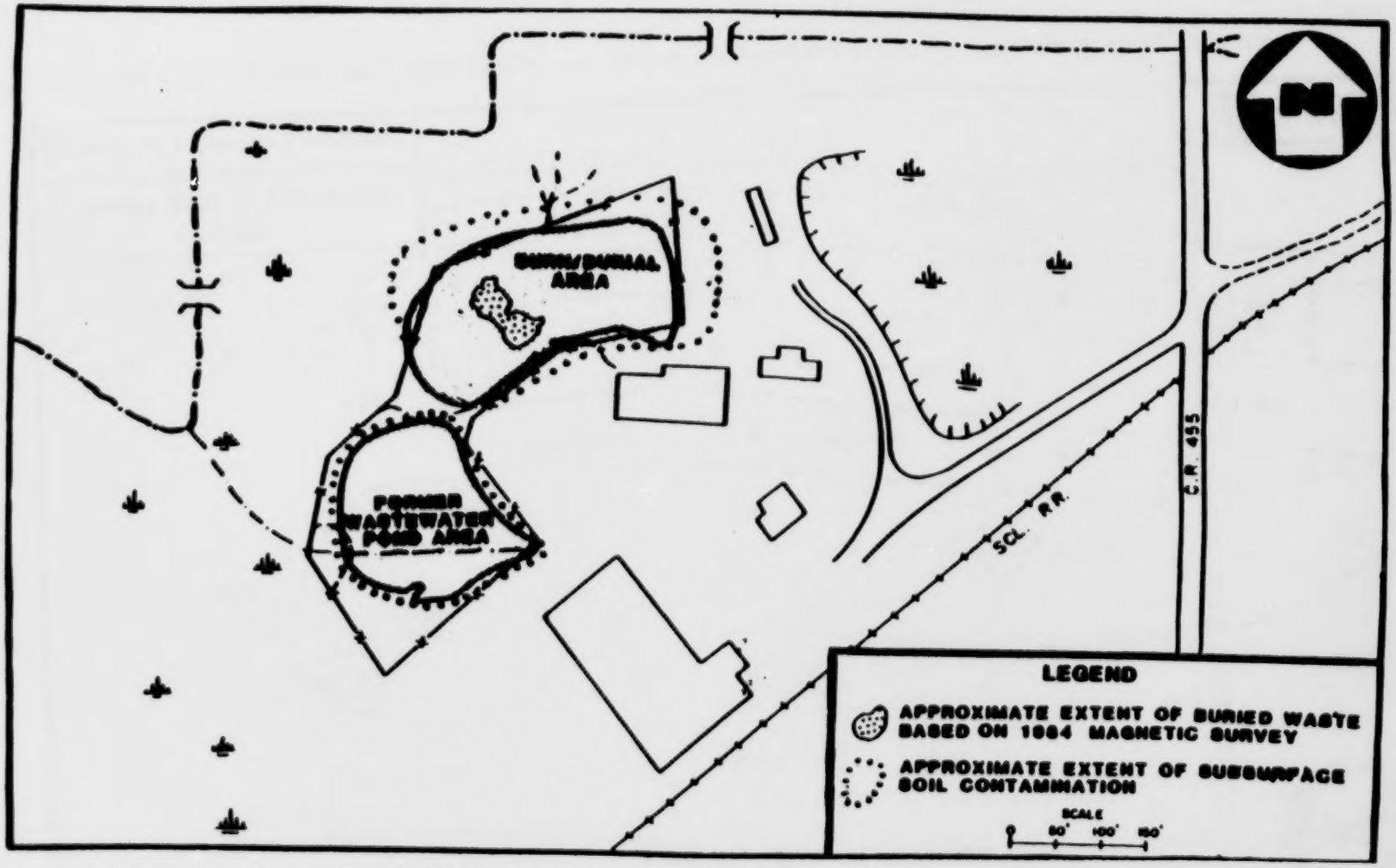

Figure 12 - Source Area Soil Contamination, Main Facility.

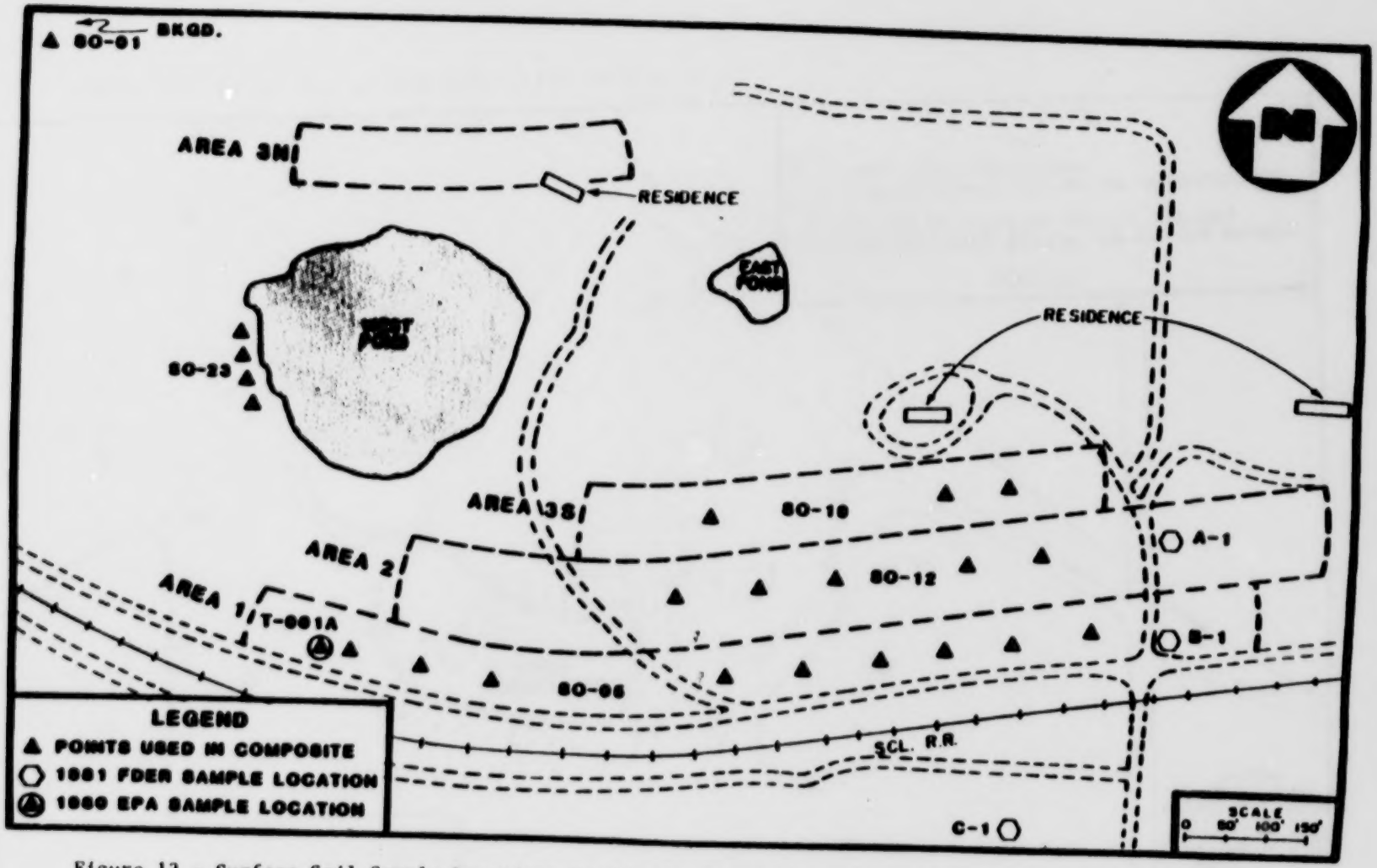

Figure 13 - Surface Soil Sample Locations Used in the Remedial Investigation, Spray Irrigation Field.

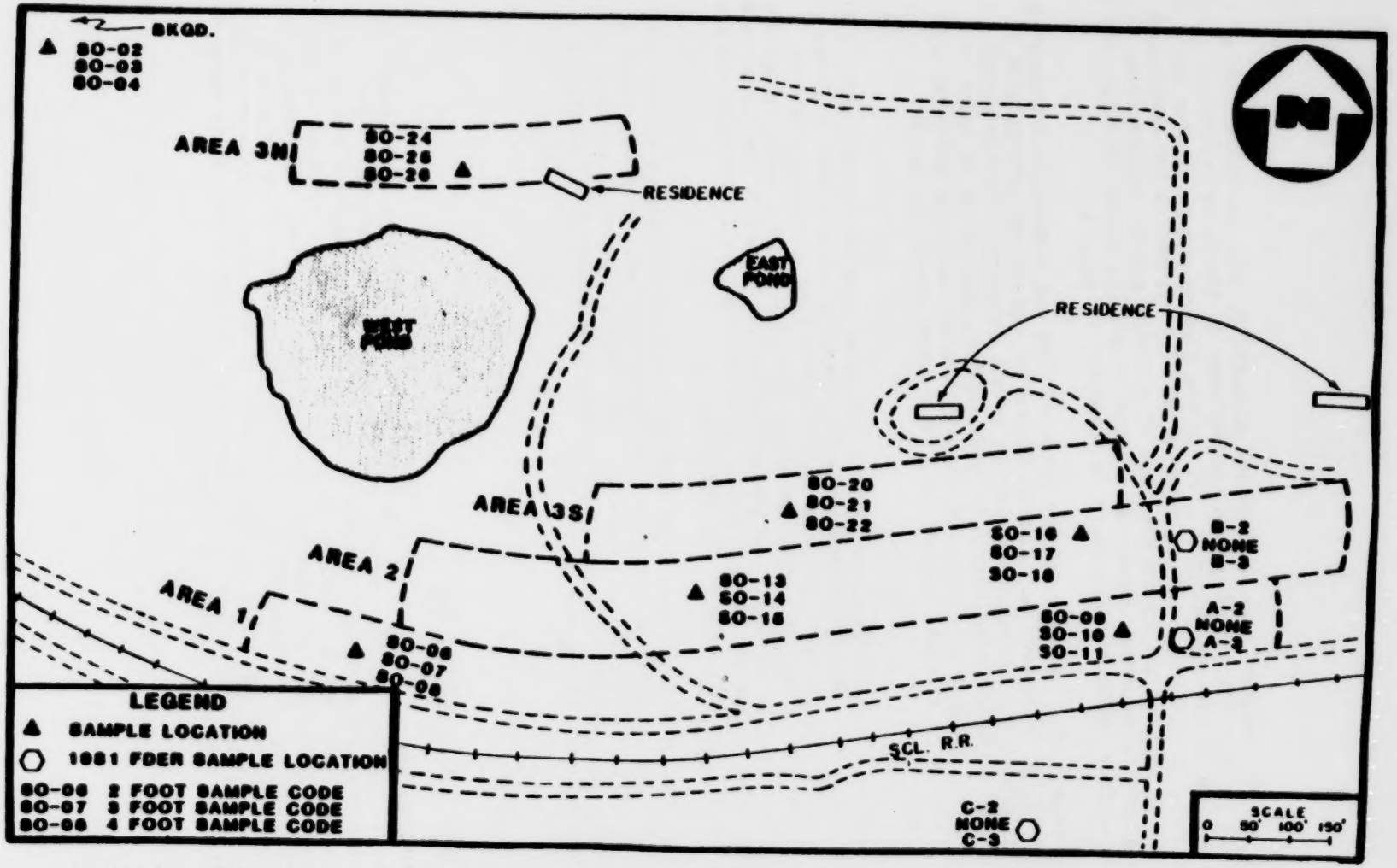

Figure 14 - Subsurface Soil Sampling Locations Used inthe Remedial Investigation - 2, 3, and 4 Foot Depths, Spray Irrigation Field.

All control samples, both surface and subsurface, were collected from a citrus orchard which lies upgradient and west of the spray irrigation field. The nature of the contaminants found in the surface and subsurface soils at the spray irrigation field can also be directly related to the operations at the Tower Site due to the presence of 4,4'-DDT and its derivatives. A comparison of selected contaminants found in samples collected during the RI from surface and subsurface soils is presented in Table 4.

The surface soil sampling efforts revealed that soils could be transported downgradient if eroded, as shown in Figure 15, but it was demonstrated in the RI Report that significant erosion is not occuring. The horizontal extent of surface contamination is generally expected to be as shown in Figure 16. Surface expression of the soil contamination is reflected by the presence of stressed vegetation in the areas around the former sprayheads.

Analysis of the subsurface samples has indicated that contamination by 4,4'-DDT and its derivatives is detectable to depths of about 3 feet in Areas 1, 2, and 3S (Figure 17). In Area 3N, the spray line apparently was not used to any great extent during the Tower Chemical Company spray irrigation operations because no contamination was identified in any of the subsurface soil samples collected in that area. No significant soil contamination was found along the west bank of the West Pond.

The remedial investigation showed that no contamination exists within the spray irrigation field in excess of the established soil clean-up criteria for this site (Appendix D). Therefore, soil contamination in the area of the spray irrigation field is not of concern from either a public health or an environmental standpoint.

HYDROGEOLOGY

Groundwater Characteristics

Groundwater in the vicinity of the Tower Site occurs in the unconfined surficial aquifer and the confined Floridan Aquifer (Figure 18). The surficial aquifer extends over most of the site and is composed mainly of quartz sand with varying amounts of clay and silt. Wells screened in the surficial aquifer are not used for domestic water supplies. Groundwater in the Floridan Aquifer flows through solution channels and joint systems in the limestone bedrock. The Floridan Aquifer is the major potable drinking water source in central Florida and many local residents have wells screened in solution channels within the Floridan Aquifer.

Table 4
Comparison of Selected Contaminants in Soils, Spray Irrigation Field.

Parameter (ug/kg)	Surface Control	Surface	2-Ft. Control	2-Feet	3-Ft. Control	3-Feet	6-Ft. Control	6-Feet
4,4'-DDT	-	130-360	-	ND-55	-	ND-103	-	ND-90
4,4'-DDE	69	890-1,300	-	ND-114	R	ND-197	-	ND-180
4,4'-DDD	-	-	-	-	R	-	-	-
Alpha-BHC	-	-	-	-	-	-	-	-
Beta-BHC	-	-	-	-	-	-	-	-
Gamma-BHC	-	-	-	-	-	-	-	-
Delta-BHC	-	-	-	-	-	-	-	-
Ethion	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzilate	NA	NA	NA	NA	NA	NA	NA	NA
Dicofol	NA	NA	NA	NA	NA	NA	NA	NA
Xylene	-	-	-	-	-	-	-	-
Ethyl Benzene	-	-	-	-	-	-	-	-
Chromium	14,000	1,200-2,350	3,100	840-1,700	2,900	1,000-1,700	2,900	710-1,900
Copper	51,000	2,900-12,000	-	ND-3,200	-	ND-4,500	-	-
Sample Locations	SO-01	SO-03, SO-12 SO-19	SO-02	SO-06, SO-09, SO-13, SO-16, SO-20, SO-26	SO-13	SO-07, SO-10, SO-14 SO-17, SO-21, SO-25	SO-04	SO-08, SO-11, SO-15 SO-18, SO-22, SO-26

- or ND Material analyzed for but not detected.
R Data invalid.
NA Not analyzed.

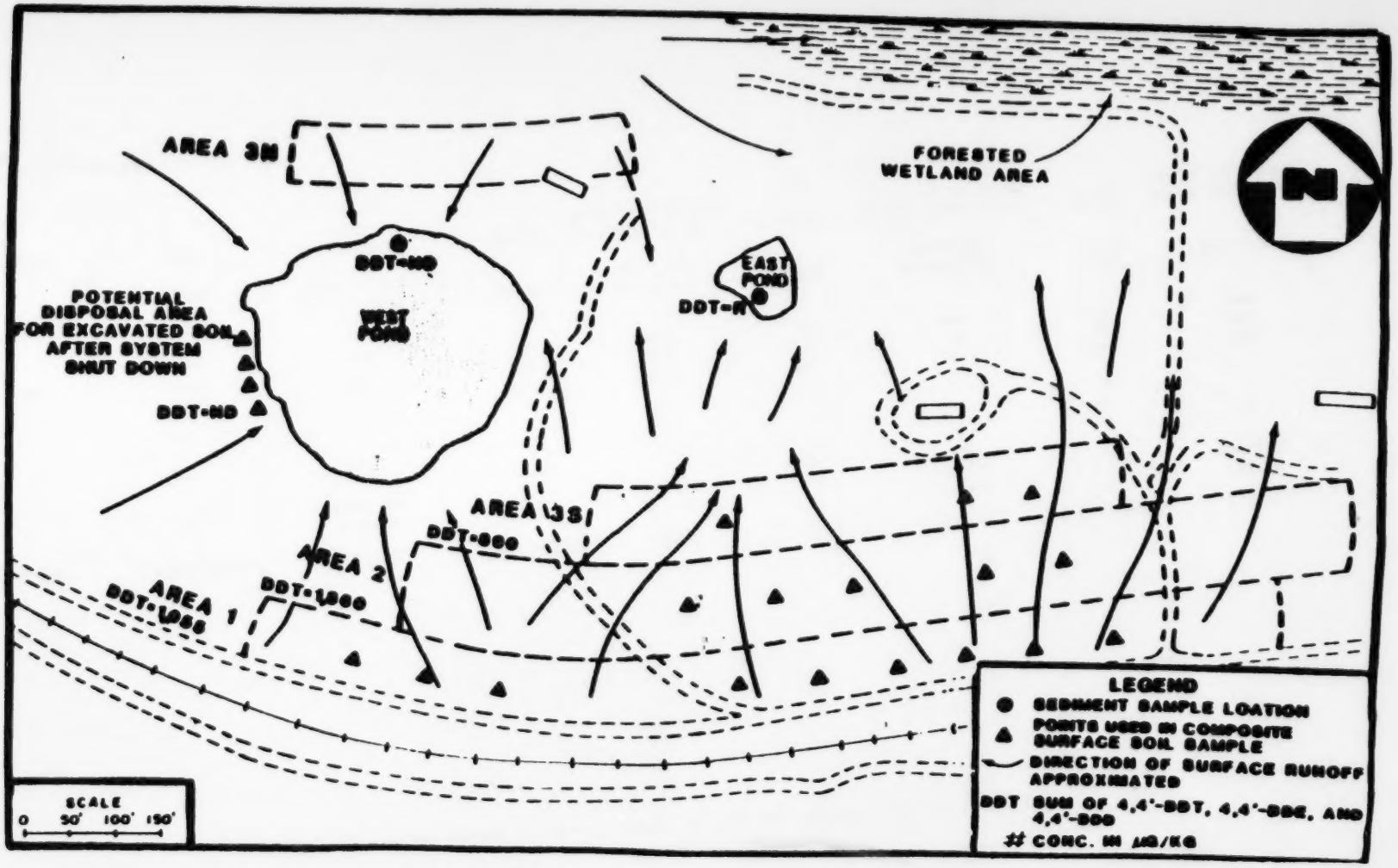

Figure 15 - Distribution of Total 4,4'-DDT and Derivatives in Surface Soils and Sediments, Spray Irrigation Field.

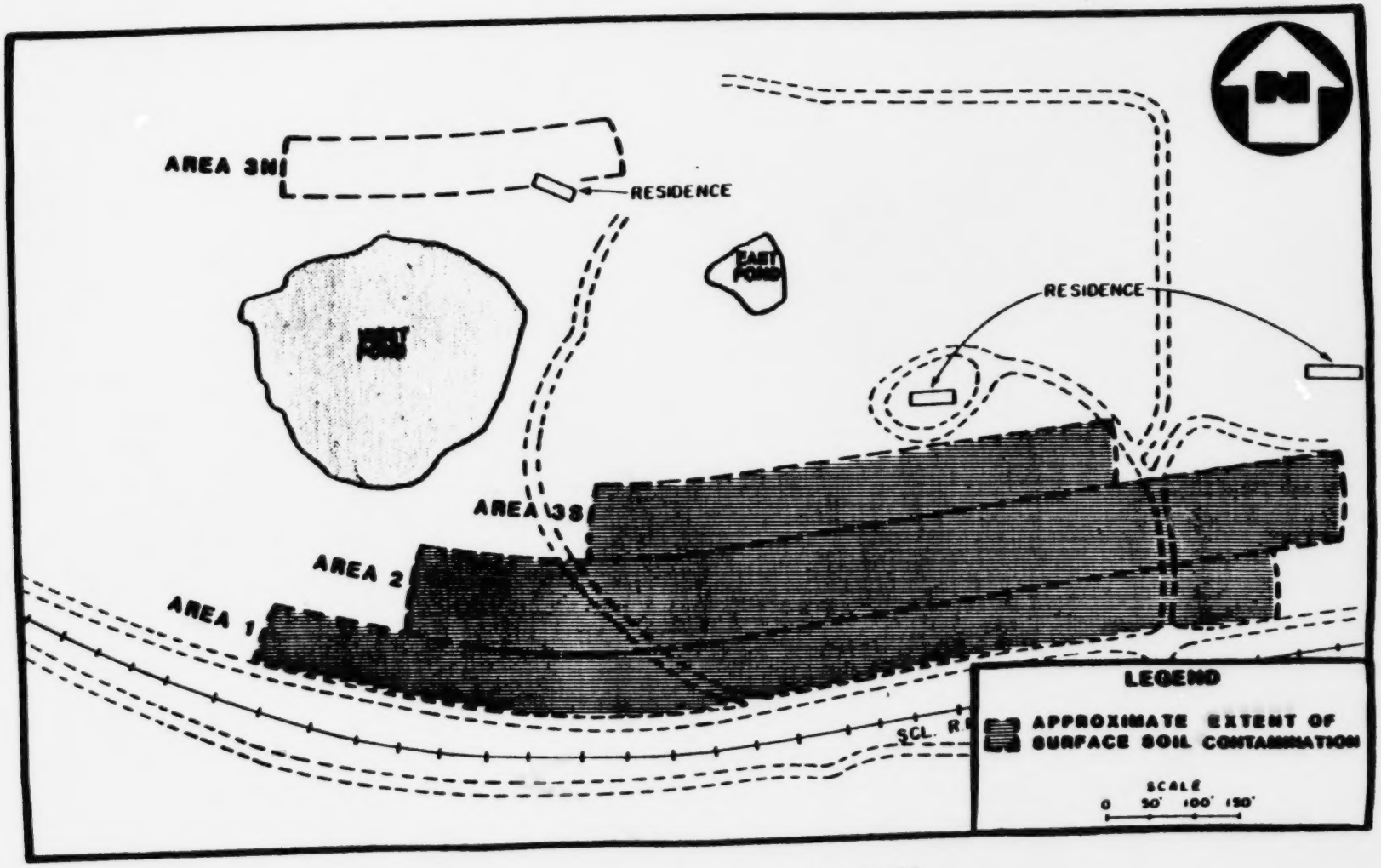

Figure 16 - Areas of Surface Soil Contamination, Spray Irrigation Field.

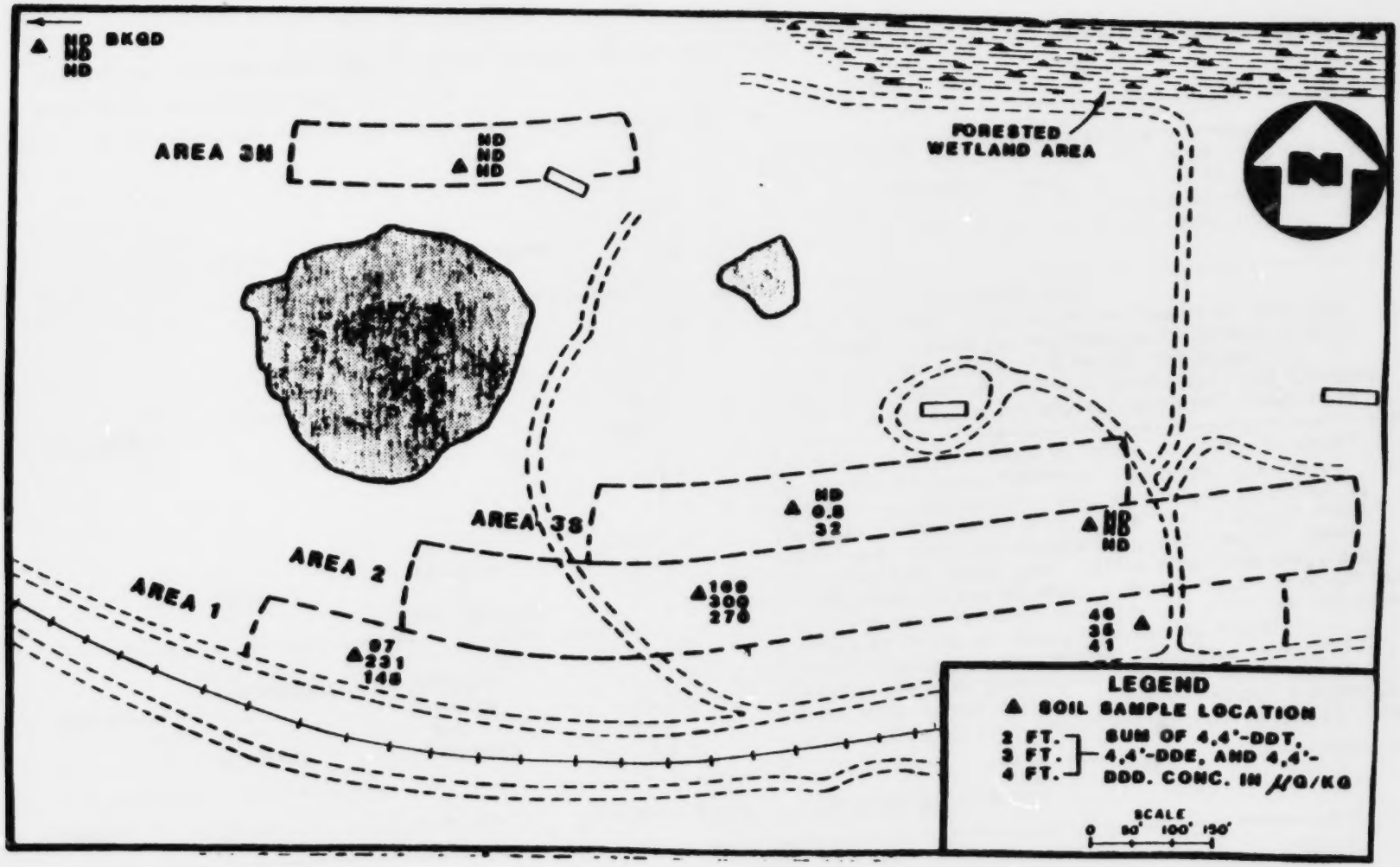

Figure 17 - Distribution of Total 4,4'-DDT and Derivatives in Subsurface Soil Samples - 2, 3, and 4 Foot Depths, Spray Irrigation Field.

System	Series	Formation	Thickness (ft.)		Lithologic Description
Quaternary	Holocene Pleistocene	Pleistocene and Holocene Deposits	0 to 90	SURFICIAL AQUIFER	Sand, tan to yellow, loose, medium to fine quartz, sometimes with shells and/or minor clay content - often has hardpan layer of iron-oxide-cemented, rusty red to dark brown, medium to fine sand in upper part of section; source of water for shallow sandpoint wells.
Tertiary	Pliocene	Upper Miocene or Pliocene Deposits	10 to 110		Upper part is tan to buff, fine to coarse sand and gray to light gray sandy clay, clayey sand, and shell beds; clay often contains abundant mollusk shells. Lower part is limestone, tan to yellow, often highly sandy, porous, and cavernous. Also with a few thin beds of brown crystalline, dolomitic limestone; Tertiary section is major source of water for shallow wells.
	Miocene	Hawthorn	250 to 500	FLORIDAN AQUIFER	Gray to blue-green and olive-green clay, sandy clay, and sandy limestone; usually phosphatic with abundant, well-rounded, polished, granules and pebbles of phosphate. Formation not usually considered a good source of water; some wells tap lenses of sand and limestone in the upper part.
	Eocene	Ocala Limestone			White to cream; chalky, massive, fossiliferous, marine limestone; with zones of tan to buff granular limestone; and discontinuous zones of gray to brown, hard, crystalline dolomite near the base of the unit. Formation considered a good source of water.

Reference: Fairchild, 1972

Figure 18 - Generalized hydrogeologic profile of the surficial aquifer system and the Floridan Aquifer.

Surficial Aquifer. The surficial aquifer, in the area of the Tower Chemical Company site, flows generally to the northeast, towards the unnamed creek. The water table ranges from 0 to 20 feet below the land surface. Horizontal groundwater velocity is estimated to be less than 2 feet per year over most of the site, but a 150 foot area extending from the northeastern portion of the burn/burial area may have a horizontal velocity of 10 feet per year due to localized mounding of the groundwater. Groundwater flow from the site may, in part, discharge into the unnamed creek north of the site and ultimately reach Lake Apopka. Based on the field investigation, it is very likely that a vertical component of flow exists from the surficial aquifer downward into the Floridan Aquifer.

Floridan Aquifer. The Floridan Aquifer, in the site area, is poorly confined by the overlying Hawthorn Formation which is laterally discontinuous across the Main Facility due to the presence of relic sinkholes. Groundwater in the Floridan Aquifer moves rapidly through solution channels in a northeasterly direction. The top of the Floridan Aquifer ranges between 54 and 188 feet below the land surface, with the potentiometric surface between 5 and 10 feet below the land surface. Generally, the potentiometric surface of the Floridan aquifer imitates the topology of the surficial aquifer's water table. The Floridan Aquifer is the primary drinking water source within the site area.

Analytical Results

Surficial Aquifer. Groundwater samples from the surficial aquifer were collected in November 1984 and in March 1985 from 8 new monitoring wells and 2 wells installed by the Tower Chemical Company (Figure 19). Samples collected from the upgradient well, DS-01, provided background information. Two additional samples were collected to provide information on the ground water quality in areas of high soil contamination: from the surface of the wastewater pond (a surface expression of the water table) and from ground water which had infiltrated an excavation trench in the area of the former wastewater pond.

Table 5 lists the contaminants of concern identified in the surficial aquifer at the main facility. The contaminants of concern were selected based on the overriding health and environmental risks posed by the compounds present, as determined in accordance with the Public Health Evaluation Manual, October 1986, and existing environmental laws.

The results of the groundwater sampling and analysis show that the surficial aquifer at the main facility is contaminated with xylene, ethyl benzene, gamma-BHC, chlorobenzilate, 4,4'-DDT with its derivatives and several other compounds. Contaminant migration to the northeast has extended beyond the boundaries of the burn/burial area with possible contaminated groundwater

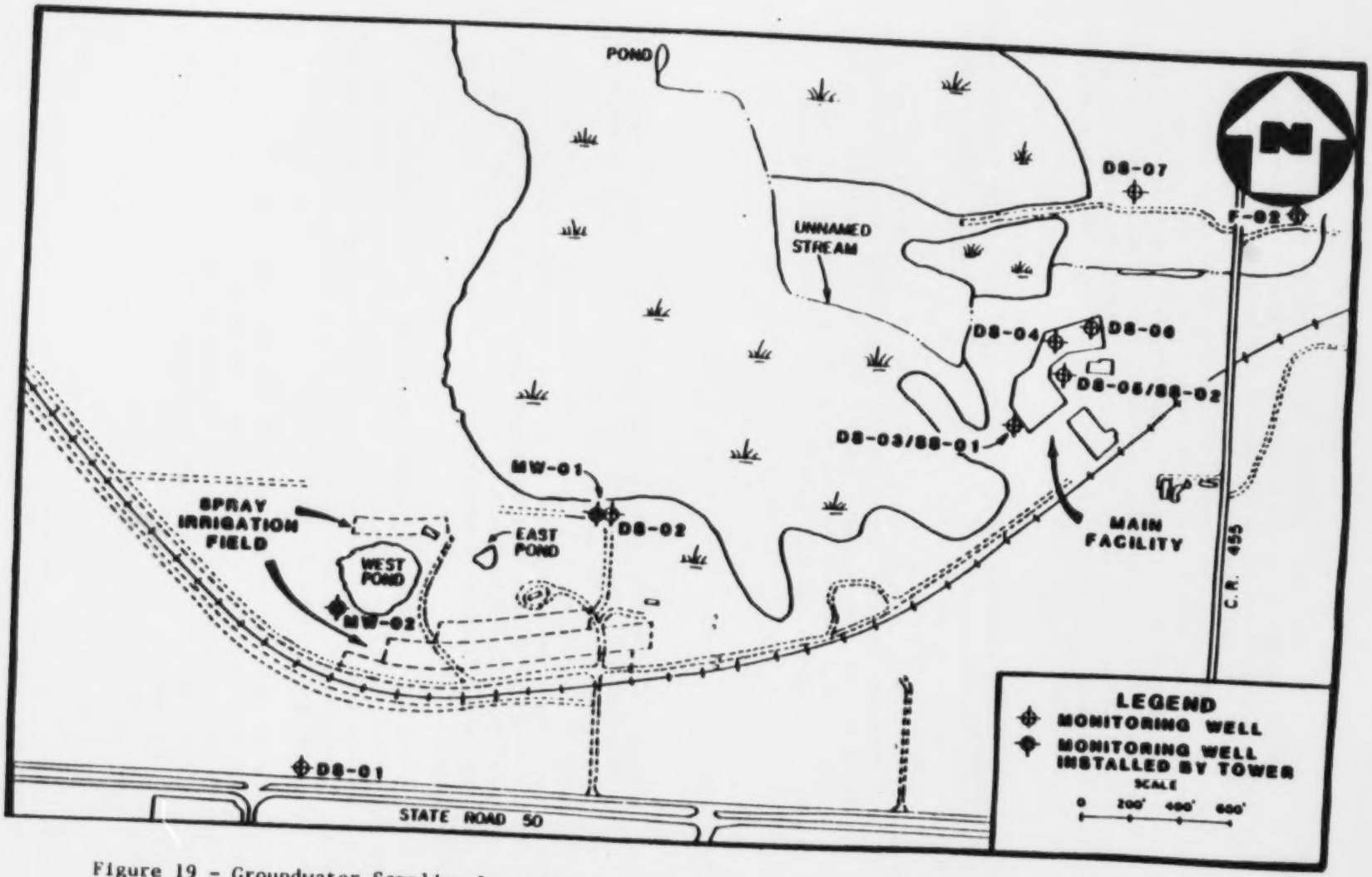

Figure 19 - Groundwater Sampling Locations Used During the Remedial Investigation, Surficial Aquifer, Main Facility.

Table 5
Comparison of Selected Groundwater Contaminants in the Surficial Aquifer, Main Facility.

Parameter (ug/l)	Upgradient	Below Former Wastewater Pond			Below Burn/ Burial Area	Downgradient
		10 Feet	30 Feet	60 Feet		
4,4'-DDT	-	-	-	-	-	-
4,4'-DDE	-	0.99	-	-	ND-0.1	-
4,4'-DDD	-	0.22	-	-	ND-1.8	-
Alpha-BHC	-	-	-	-	ND-0.21	-
Beta-BHC	-	-	-	-	-	-
Gamma-BHC	-	-	-	-	ND-5.5	-
Delta-BHC	-	-	-	-	-	-
Ethion	-	-	ND-23N	-	-	NA
Chlorobenzilate	NA	-	-	ND-40	ND-9.8	NA
Dicofol	NA	270	ND-700	42-320J	ND-460	NA
Xylene	-	14	150-830	62-3,900	ND-1,700	-
Ethyl Benzene	-	4J	ND-58	14-1,000J	ND-500J	-
Chromium	27J-230	13	17-33J	110-700	ND-1,100	-
Copper	26J-180	440	11-22	52-430	15-100J	5J
Sample Locations	DS-01	TRI-01W	SS-01, SS-02	DS-03, DS-05	DS-04, DS-06	DS-07

- or ND Material analyzed for but not detected.
J Estimated value.

discharge occurring into the ditch east of the facility (Figure 20). Vertically, contaminated ground water in the burn/burial area was identified at a depth of 35 feet in monitoring wells set on top of the Hawthorn formation.

Activities from the Tower Chemical Company site did impact the surficial aquifer groundwater in the vicinity of the main facility. Contaminants were also detected at a depth of 60 feet beneath the former wastewater pond in the relic sinkhole. Migration of contaminants from the surficial aquifer is probably occurring via this relic sinkhole.

Samples collected from the area of the spray irrigation field indicated that there has been minimal impact on the surficial aquifer in that area, and no health criteria were exceeeded. Therefore, it was concluded that the wastewater spray irrigation practices of the Tower Chemical Company did not significantly impact surficial ground water resources in the vicinity of the spray irrigation field.

Floridan Aquifer. Groundwater samples from the Floridan Aquifer were collected from a total of 12 private water supply wells and two newly installed monitoring wells (Figure 21). Monitoring well MFW-01 was used as a background well.

The analytical results of the groundwater samples collected from the Floridan Aquifer indicate that Tower Chemical Company site has not impacted the groundwater quality of the Floridan Aquifer. Of all compounds identified in samples collected from the Floridan Aquifer, the only constituent known to have been used by the Tower Chemical Company is copper. However, the concentration of copper found in the downgradient Floridan Aquifer samples is similar to the concentration found in the sample collected from the upgradient well. Overall, it is believed that the operations associated with the Tower Chemical Company have not impacted the water quality of the Floridan Aquifer.

SURFACE WATER AND SEDIMENTS

Surface water and sediment samples were collected from the following locations in the site vicinity: the east ditch on the main facility, the unnamed stream north of the site, and the spray irrigation field ponds.

Surface Water

Surface water samples were collected from the points indicated in Figure 22. The background surface water sample was collected from a small pond within the swamp (SW-01); at a point unaffected by the Tower Chemical Company operations.

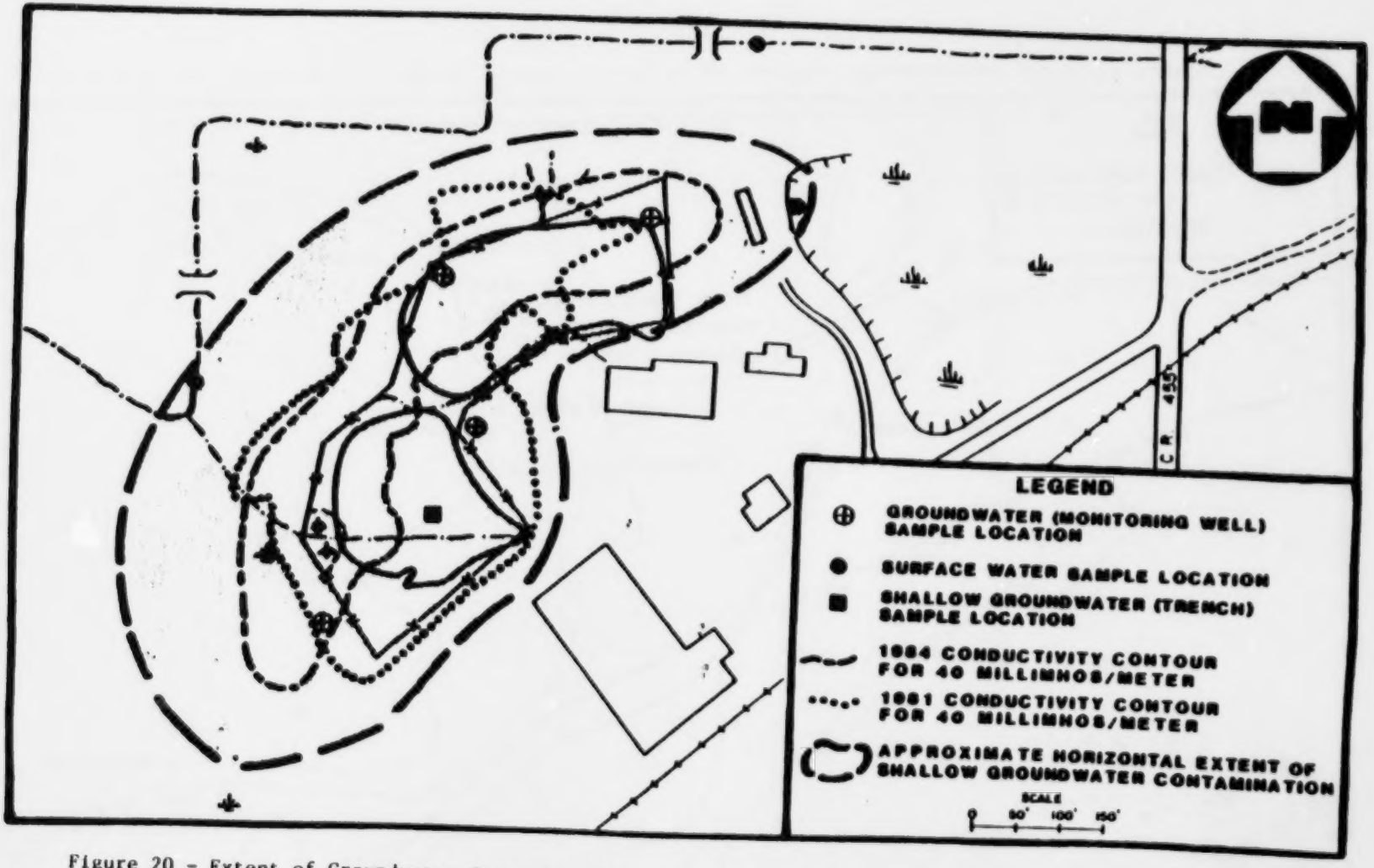

Figure 20 - Extent of Groundwater Contamination in the Surficial Aquifer, Main Facility.

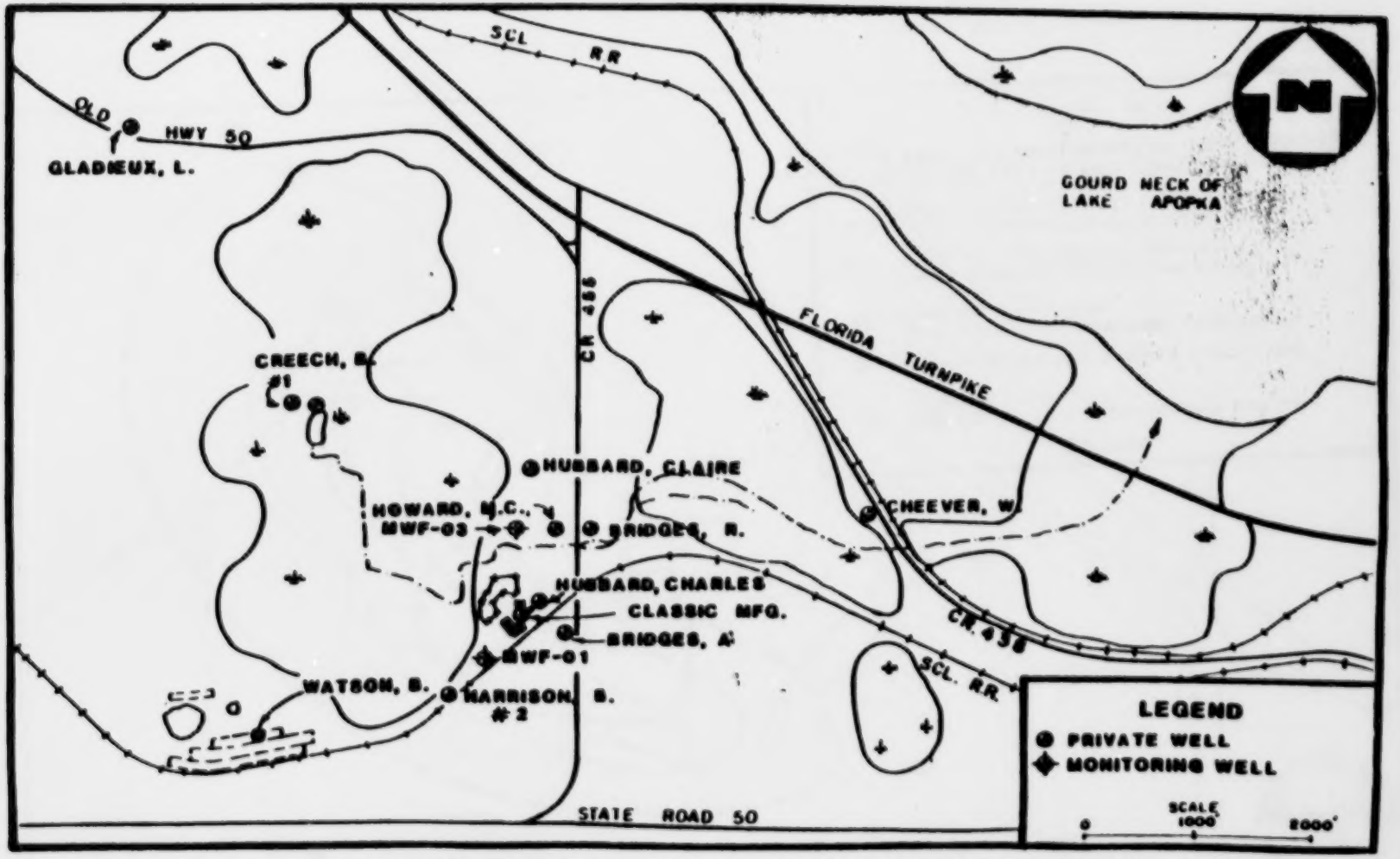

Figure 21 - Groundwater sampling locations used in the Remedial Investigation, Floridan Aquifer.

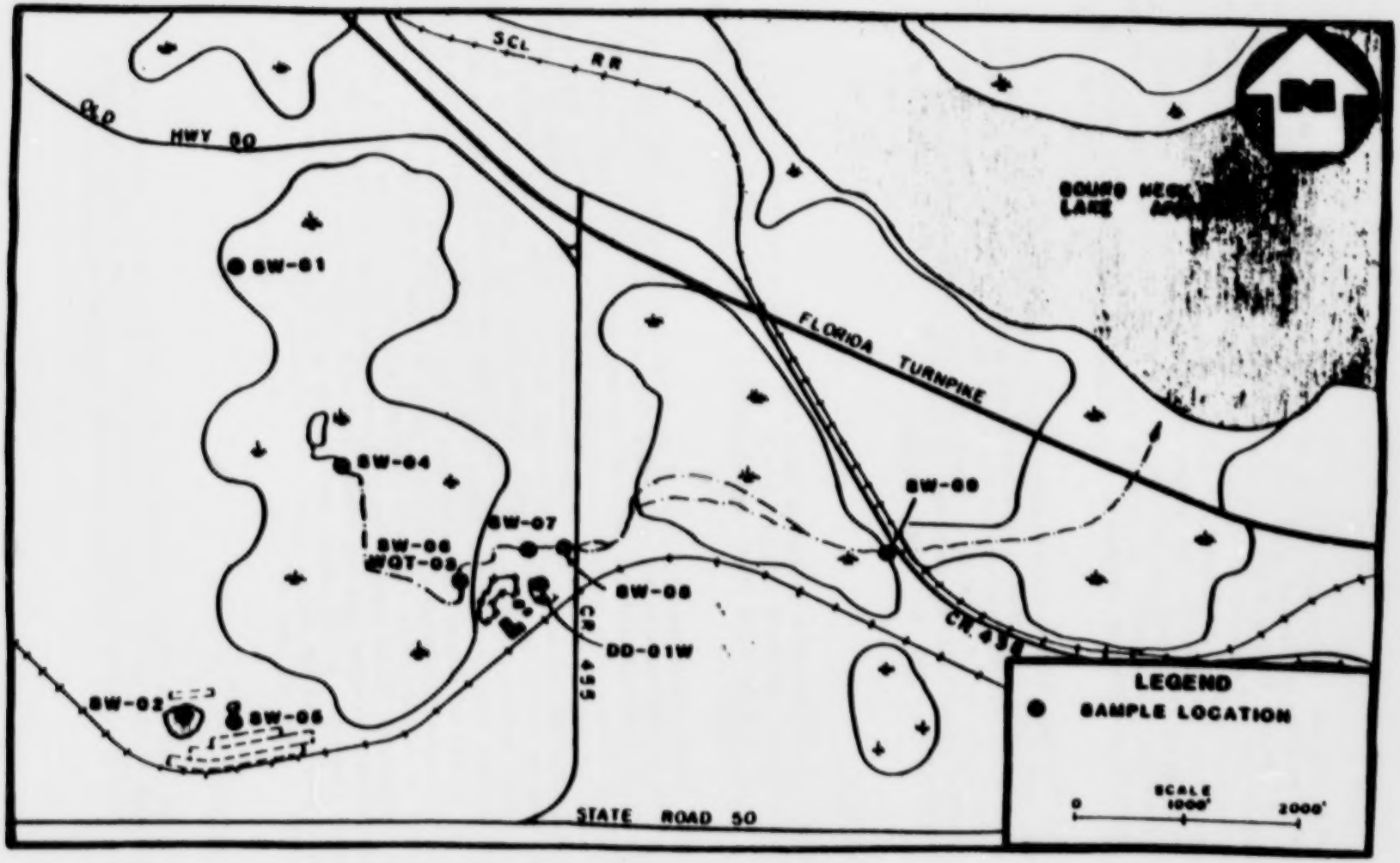

Figure 22 - Surface Water Sample Locations Used in the Remedial Investigation.

Table 6 shows the concentrations of selected contaminants found in surface water samples collected from both the unnamed stream and the east ditch. It is obvious that 4,4-DDT and its derivatives were found in surface water samples collected west of the main facility from the unnamed stream at the former wastewater pond overflow point and east of the main facility in the east ditch. Therefore, the nature of the contaminants in these two areas can be related to past activities at the Tower Chemical Company. However, as previously discussed, it appears that these contaminants may be the result of groundwater discharge rather than the result of surface water run-off.

Table 7 shows all the contaminants found in the surface water samples collected from the spray irrigation field ponds. As can be seen from this table, all contaminants were at low concentrations and these contaminants do not appear to be related to Tower Chemical Company operations. It appears that activities conducted in the spray irrigation field did not significantly impact the nearby ponds.

Sediments

Sediments samples were collected from the points indicated in Figure 23. The background sediment sample, SE-01, was collected from a small pond located in a swamp area which was unaffected by operations from the Tower Chemical Company.

Table 8 shows the concentrations of selected contaminants from the samples collected in the unnamed tributary and from the east ditch. The concentrations of 4,4'-DDT and its derivatives and metals in samples from the unnamed tributary were comparable to those found in the control sample and all of which are below action levels established in this Record of Decision. In contrast, the concentration of copper from the east ditch sample was 50,000 ug/kg, which is significantly higher than the concentration found in the control sample (5,000 ug/kg). The copper contamination can be related to operations conducted at the Tower Chemical Company. However, the concentration levels of copper contamination in the east ditch does not exceed the health based clean-up criterion. Table 9 presents the maximum concentrations of contaminants from all samples collected from the ponds in the spray irrigation field area. The compounds identified in the irrigation field sediment samples are not associated with operations from the Tower Chemical Company. In any case, they do not significantly differ from the control sample and are below established clean-up levels, thus the contaminants do not present any significant health or environmental threat.

AIR INVESTIGATION

During the 1983 EPA removal action air quality monitoring stations were established at the points shown in Figure 24. The monitoring conducted during the 1983 removal activity indicated that the concentration of

Table 6
Comparison of Selected Contaminants in Surface Water Samples,
Main Facility.

Parameter (ug/l)	Control	Unnamed Stream				East Ditch
		Upstream	Downstream of of Overflow	North of Main Facility	Downstream	East of Main Facility
4,4'-DDT	-	-	-	-	-	0.18
4,4'-DDE	-	-	0.3-1.2	-	-	0.32J
4,4'-DDD	-	-	0.1J-0.3	-	-	0.072
Alpha-BHC	-	-	-	-	-	-
Beta-BHC	-	-	-	-	-	-
Gamma-BHC	-	-	-	-	-	-
Delta-BHC	-	-	-	-	-	-
Ethion	NA	NA	NA	NA	NA	0.5
Chlorobenzilate	NA	NA	NA	NA	NA	-
Dicofol	NA	NA	NA	NA	NA	0.22
Xylene	-	-	-	-	-	-
Ethyl Benzene	-	-	-	-	-	-
Chromium	-	-	6-10	-	-	-
Copper	-	-	ND-39	-	-	68
Sample Locations	SW-01	SW-04	SW-06, WQT-03	SW-07	SW-08, SW-09	DD-01W

- or ND Material analyzed for but not detected.
J Estimated value.
NA Not analyzed.

Table 7
Maximum Concentrations of All Contaminants Found in
Samples Collected From Ponds in the
Spray Irrigation Field Area.

Parameter (ug/l)	Spray Irrigation Field Ponds
Bis(2-Ethylhexyl)phthalate	-
Acetone	50J
Carbon Disulfide	2J
Chromium	6
Lead	9J
Zinc	-
Aluminum	410
Manganese	-
Iron	200
Sample Locations	SW-02, SW-05

J Estimated value.
- Material analyzed for but not detected.

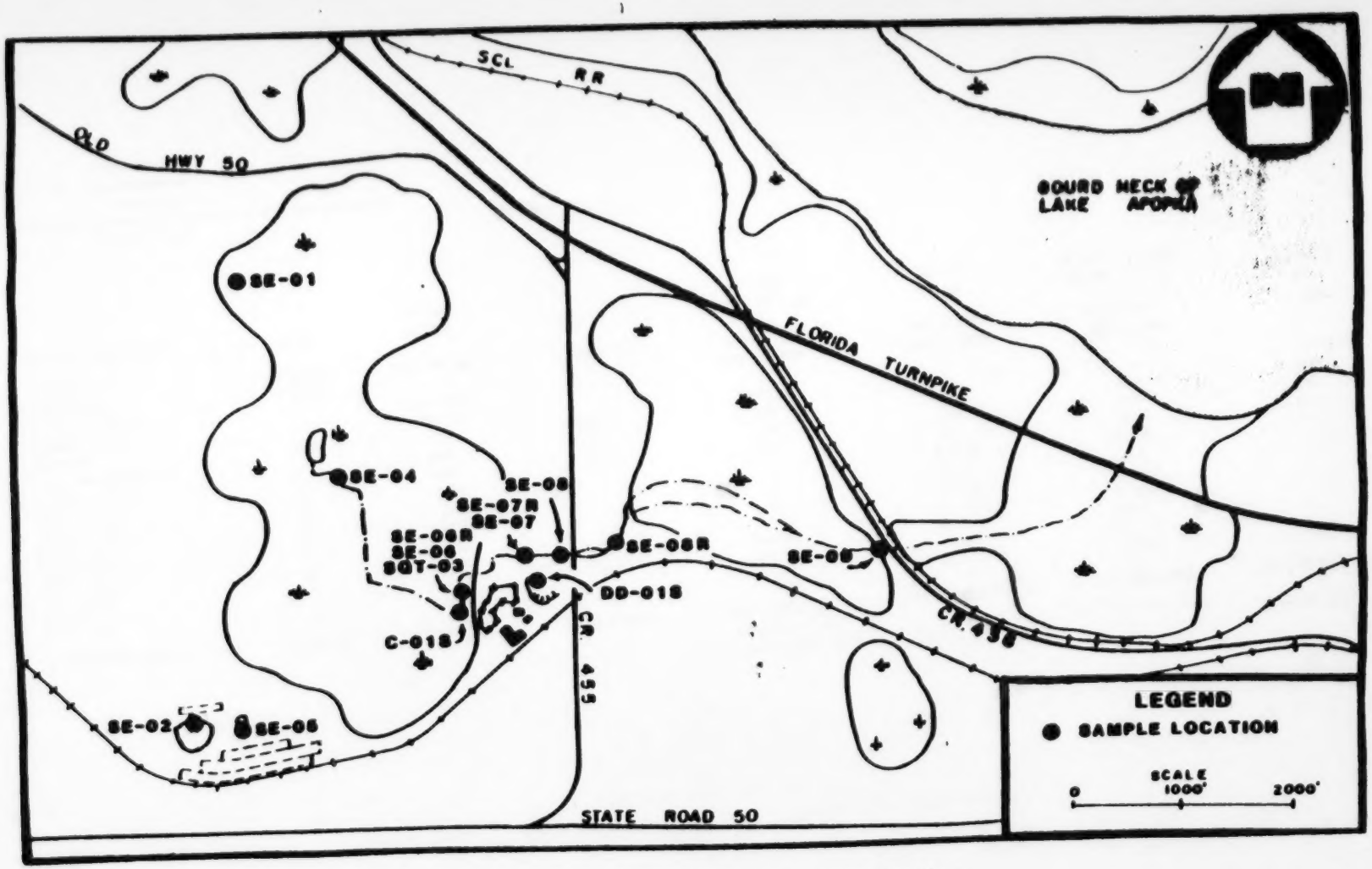

Figure 23 - Sediment Sample Locations Used in the Remedial Investigation.

Table 8
Comparison of Selected Contaminants Found in Sediments,
Main Facility.

Parameter (ug/kg)	Control	Unnamed Stream					East Ditch
		Upstream	At Overflow	Downstream of Overflow	N of Main Facility	Downstream	E of Main Facility
4,4'-DDT	R	R-ND	-	-	R-ND	R-ND	58
4,4'-DDE	R	R-ND	1,800C	ND-270	R-52	53-7.1	-
4,4'-DDD	R	R-ND	120	ND-46	R-120	ND-2.2	-
Alpha-BHC	R	R-ND	-	-	R-ND	R-ND	-
Beta-BHC	R	R-ND	-	-	R-ND	R-ND	-
Gamma-BHC	R	R-ND	-	-	R-ND	R-ND	-
Delta-BHC	R	R-ND	-	-	R-ND	R-ND	-
Ethion	NA	NA	NA	NA	NA	NA	NA
Chlorobenzilate	NA	NA	NA	NA	NA	NA	NA
Dicofol	NA	NA	NA	NA	NA	NA	NA
Xylene	-	ND-53	-	ND-53	-	-	-
Ethyl Benzene	-	ND-1,100	-	-	-	-	-
Chromium	1,000J	-	-	300J-2,500	200J-2,800	ND-7,200	-
Copper	6,000J	600J-1,400	7,000	ND-1,500	ND-7,600	ND-8,600	53,000
Sample Locations	SE-81	SE-80 SE-80R	C-815	SE-86, SQT-83 SE-86R	SE-87 SE-87R	SE-88, SE-89 SE-88R, SE-89R	DD-815

R Data invalid.
- or ND Material analyzed for but not detected.
C Confirmed by GC.
NA Not analyzed.
J Estimated value.

Table 9
Maximum Concentrations of All Contaminanats Found in Pond Sediments,
Spray Irrigation Field.

Parameter (ug/l)	Control Soil	Sprayfield Soil	West Pond Sediment	East Pond Sediment
Hexadecanoic Acid	-	500JN	1,000JN	R
Toluene	-	20J	64	-
Barium	6,100	2,500	8,200	-
Cadmium	650	-	28	-
Chromium	14,000	2,350J	500J	300J
Copper	51,000	12,000	2,000J	1,000J
Lead	9,400	2,900	1,000J	900J
Selenium	-	-	240	-
Vanadium	-	1,900	800	400J
Zinc	81,000	5,900	-	700
Aluminum	1,800,000	1,450,000J	260,000	530,000
Manganese	82,000	15,000	600	-
Iron	2,600,000	960,000J	160,000	34,000
Sample Locations	**SO-01**	**SO-05, SO-12 SO-19**	**SE-02**	**SE-05**

- Material analyzed for but not detected.
J Estimated value.
N Presumptive evidence of presence of material.
R Data invalid.

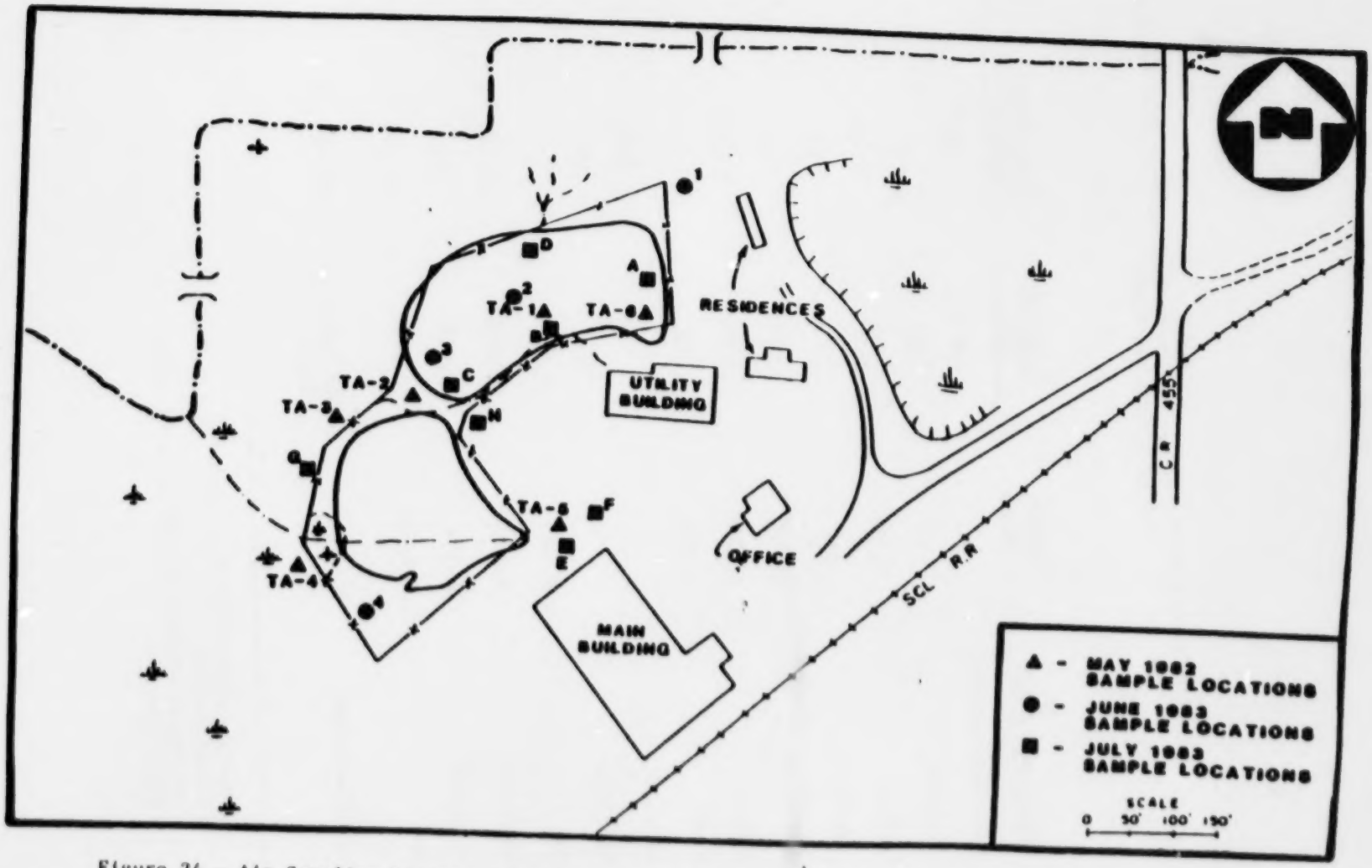

Figure 24 - Air Sampling Locations Used During the EPA Removal Action, Main Facility.

particulate and volatile contaminants in the air did not differ significantly before or during the excavation activity. The ambient concentrations of the particulate and volatile pesticides in samples collected from the site remained at levels between 10^{-4} and 10^{-9} milligrams per cubic meter before and during the immediate removal. Excavation work in the former disposal areas required personnel respiratory protection for those workers in the immediate vicinity as a precautionary health and safety measure.

The air monitoring performed during the RI found no detectable levels of contaminants in the breathing zone except when five of the six monitoring wells at the main facility were opened and purged for sampling. While working at these wells personnel respiratory protection was required because of the extremely elevated hydrogen sulfide concentrations. An ambient hydrogen sulfide problem was not detected.

ENDANGERED AND THREATENED SPECIES

There are no federally-listed protected plant species in Lake County. Of the State-protected plant species only Adder's tongue fern has been reported as possibly existing in the vicinity of the site. This plant, whose scientific name is Ophioglossum palmatum, is considered endangered by the State of Florida.

There are several federally protected animal species within the area of the Tower Chemical Company site. These endangered or threatened species are listed in Table 10. Any remedial action taken at this site must include consideration of the potential impact that implementation could have on these species.

A Natural Resource Damage Assessment was conducted for this site by the U. S. Fish and Wildlife Service (FWS). In this assessment, the FWS concluded that the Tower Chemical Company site may have impacted the surrounding trustee resources in a manner that threatens the ability of the area to sustain resident floral and faunal populations. However, after reviewing the remedy being proposed for the Tower Chemical Company site, the FWS concluded that the steps being recommended for remediation will be sufficient to provide protection of the trustee resources (Appendix E).

Table 10
Federally Protected Species Which Have Known Habitats
Within the Vicinity of the Tower Chemical Company Site.

Common Name	Scientific Name	Designation
Mammals		
Florida Panther	Felis concolor coryi	E
Birds		
Bald Eagle	Haliaeetus leucocephalus	E
Bachman's Warbler	Vermivora bachmanii	E
Ivory-billed Woodpecker	Campephilus pricipalis	E
Red-cockaded Woodpecker	Picoides borealis	E
Reptiles		
American Alligator	Alligator mississippiensis	T
Eastern Indigo Snake	Drymarchon corais couperi	T

E - Endangered
T - Threatened

Source: USFWS, 1985.

SECTION IV
ENFORCEMENT PROFILE

Initial notice letters were sent to all identified potentially responsible parties (PRPs) on March 5, 1982. The recipients included Ralph Roane, President, Tower Chemical Company; James Gallagher, Trustee, Gallagher Land Trust ("Trust"); and John Balmenard, owner, O. T. Enterprises. Following issuance of the letters, a meeting was held on May 15, 1982 in EPA's regional offices in Atlanta, Georgia with all PRPs except Ralph Roane present. At the meeting, representatives of the Trust committed to prepare a feasibility study to identify options for clean-up of the site. Following several requests for extentions of time by the Trust and repeated missed deadlines for providing the study, EPA, with the encouragement of the State of Florida, determined in June 1983 that an immediate removal action was warranted.

On June 9, 1983, EPA Region IV issued a CERCLA Section 106 Administrative Order to the PRPs requiring a surface clean-up of the site. The PRPs failed to comply with the order and during June and July 1983, EPA Region IV conducted a fund financed removal action at the site.

Prior to the commencement of the Remedial Investigation and Feasibility Study (RI/FS) at the site EPA again notified the PRPs and invited them to conduct or participate in the RI/FS. The PRPs failed to reply and EPA initiated the RI/FS.

On June 30, 1984, EPA Region IV referred a Section 107 cost recovery case to EPA Headquarters and to the Department of Justice. The complaint was filed in April 1985. The defendants named were those noted above. On June 5, 1986, an amended complaint was filed naming individual Trust members as defendants. A trial date had been set for June 1987, but the case has been removed from the trial docket pending finalization of a Consent Decree between EPA and several individual members of the Gallagher Land Trust to partially reimburse the Hazardous Substances Trust Fund for expenditures related to the 1983 removal action.

To date, the PRPs have not made a proposal to undertake any response actions at the site and, based on past performances, there is no reason to believe that they will do so in the future.

SECTION V
ALTERNATIVES EVALUATION

PUBLIC HEALTH AND ENVIRONMENTAL OBJECTIVES

Public Health Concerns

The public health threat posed by the Tower Chemical Company site, as identified in the Risk Assessment (Appendices O and P, RI), is relatively minimal. Several complete exposure pathways exist: ingestion of contaminated soils and surface water, physical contact with contaminated soils and surface water, inhalation of airborne particulates, and potential for ingestion of contaminated groundwater via migration of contaminated surficial aquifer ground water into the Floridan Aquifer. The Risk Assessment found that the site currently appears to pose no significant health threat, but potential exposures are a risk. This was supported by the CDC/ATSDR Public Health Evaluation (Appendix F).

Environmental Concerns

Discharge of contaminated ground water from the surficial aquifer into the surface waters of the unnamed tributary north of the Tower site poses a potential environmental risk. The unnamed tributary discharges into the Gourd Neck area of Lake Apopka and several federally protected endangered or threatened species live within the range of the Tower Chemical Company Site.

TECHNOLOGIES CONSIDERED

Several technologies were considered for remediating the Tower Chemical Company site. The technologies were presented in groups targeted at remediating a single aspect of the site. Table 11 shows the technologies considered for remediation of surface and groundwater contamination, technologies considered for remediation of soil contamination, and technologies responding to institutional controls.

Several combinations of technologies will provide remedial actions which comply with applicable, relevant, and appropriate environmental laws. However, preference was given to treatment technologies or resource recovery options which reduce the toxicity, mobility or volume of the waste to the maximum extent practicable. Remediation of the site will respond to issues raised under the Safe Drinking Water Act (SDWA), Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA).

Table 11. All Technologies Considered for Remedial Response at the Tower Chemical Company Site.

GROUND WATER

- Alternate Water Supply - Municipal Water Supply Extention
- Alternate Water Supply - Bottled Water
- Alternate Water Supply - Individual Treatment Units

- Ground Water Barrier
- Ground Water Removal
- Ground Water Treatment

SURFACE WATER

- Surface Water Removal
- Surface Water Diversion
- Point Source Runoff Diversion

SOILS AND SEDIMENTS

- Surface Capping - Clay or Synthetic Membrane
- Surface Capping - Concrete or Asphalt
- Surface Capping - Soil Mixtures
- Excavation
- Surface Soil/Sediment Removal
- On-Site Disposal
- Off-Site Disposal
- Soil Treatment - Soil Flushing/Soil Washing
- Soil Treatment - Biodegredation
- Soil Treatment - Activated Carbon
- Soil Treatment - Lime-Fly Ash Pozzolan Process
- Soil Treatment - Pozolan-Portland Cement
- Soil Treatment - Thermoplastic Microencapsulation
- Soil Treatment - Macroencapsulation
- Soil Treatment - Incineration

OTHER

- No Action
- Monitoring
- Resident Relocation
- Tanks and Concrete Pad Removal
- Surface Regrading and Revegitation

Table 12. Technologies Eliminated During the Tower Chemical Company Site Screening Process.

TECHNOLOGIES ELIMINATED	REASON
Ground Water Technologies	
Alternative Water Supply - Bottled Water	Inconvenient to residents; does not prevent dermal exposure
Surface Water Removal	Not warranted based on RI data
Surface Water Diversion	Not warranted based on RI data
Ground Water Barriers	Fail to prevent vertical migration of ground water
Soil Treatment Technologies	
Soil Flushing/Soil Washing	High natural metals content in soils prevents effective use
Biodegradation	Fails to address metals contamination
Activated Carbon	Potential development of leachate; long term monitoring required
Lime-fly Ash Pozzolan Process	Expands material volume; increases waste disposal resource needs
Pozzolan-Portland Cement Process	Expands material volume; increases waste disposal resource needs
Thermoplastic Microencapsulation	Increased cost without producing health or environmental gains; expensive
Macroencapsulation	Increased cost without producing health or environmental gains; expensive
On-site Disposal	See text
Concrete or Asphalt Cap	High failure potential
Soil Mixture Cap	High failure potential
No Action	Fails to address potential threats to the public health, welfare and the environment

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Soil Flushing/Soil Washing. This technology has been demonstrated to be feasible in soils which have low levels of naturally occuring metals, however, soils typical of this site have been shown to have very high levels of natural aluminum and iron - several orders of magnitude higher than that of the contaminants. As a result, the washing fluids would preferentially remove the naturally occuring metals rather than the low levels of contaminants.

Biodegradation. Biodegradation does not address the metals contamination found at the site and would require long term operations before full clean-up is effective. Other technologies, e.g., incineration, would provide equal destruction efficiencies in a shorter time frame.

Activated Carbon. Although this technology has been proven effective for treatment of both organics and inorganics in soils, it would require long term monitoring to insure that no leachate develops from the site. This remedy was eliminated in favor of more permanent response options.

Lime-fly Ash Pozzolan Process. Although this process is effective in addressing inorganic contamination, the volume of materials would increase, thus causing an increased disposal facility requirements. In addition, the soils being solidified contain significant amounts of organic compounds which could affect the integrity of the cement monolith. The presence of organics will require containment of the monolith within an on-site landfill built above the land surface due to the locally high water table. This technology would also require long-term (30 years) monitoring which is less favorable than technologies which provide permanent destruction of wastes. Add other technologies are equally effective for similar costs.

Pozzolan - Portland Cement Process. Same as Lime-fly Ash Pozzolan Process.

Thermoplastic Microencapsulation. Although feasible, this option requires specialized equipment, trained personnel, and is expensive. Other treatment technologies are equally effective and less expensive.

Macroencapsulation. Same as Thermoplastic Microencapsulation.

On-Site Disposal. While the volume and levels of contaminants are relatively low, a high water table at the site makes it infeasible to solidify or build an on-site landfill which meets the design specifications outlined in RCRA. It has been shown that the only feasible treatment technologies available for this site, involve total destruction of the wastes, which takes in to consideration the preference for a permanent remedy as stated in Section 121 of SARA.

Concrete or Asphalt Surface Cap. The risk of failure of a concrete or asphalt cap is high due to the potential for fracture formation.

Soil Mixture Caps. This technology is unproven and has extensive monitoring requirements. Development of dessication cracks could cause failure.

TECHNOLOGIES RETAINED

Several technologies were retained for final consideration as alternatives for remediating the site. These individual technologies are listed in Table 13. In depth discussion of each technology can be found in the FS.

During the Feasibility Study process, the retained technologies were grouped into remedial units which would accomplish specific remedial objectives (Table 14). These remedial units were then combined to develop full remedial alternatives which would respond to the conditions surrounding the Tower Chemical Company site. A total of 8 comprehensive remedial alternatives were designed from the various technologies retained after the screening process. Each of the possible alternatives was analyzed based on effectiveness implementability and cost. A general summary of the concerns surrounding each technology is presented in Table 15. It is important to note that the No-Action alternative is included in the 8 alternatives considered for final remedy selection although it was eliminated during the initial screening phase. The No-Action alternative must be included at this point to fully comply with the legal requirements.

Alternative Descriptions

Alternative 1 - No Action - Groundwater and Surface Water Monitoring. Under the no-action alternative, no additional remedial activities would be performed. Implementation of this alternative would not address the remediation of the site nor the potential threat to the public or the environment via the exposure pathways. However, the monitoring program would provide information so that possible adverse public health or environmental impacts that might arise could be addressed. At the Tower Site, early phasing of the groundwater/surface water monitoring program should be considered. Based upon the conclusions of the Remedial Investigation (RI), groundwater contamination has been demonstrated in the surficial aquifer which poses a potential threat to the Florida Aquifer.
CAPITAL COSTS: $35,000 OPERATIONS AND MAINTENANCE COSTS: 965,000

Table 14. Remedial Units and Objectives

o Ground Water/Surface Water Monitoring	o Establish base line data; identify changes in the site conditions; determine effectiveness of removal actions
o Ground Water Removal (Main Facility)/Individual Treatment Units/Water Treatment/Discharge	o Prevent migration of ground water contaminants and accidental ingestion of contaminated ground water
o Municipal Water Supply Extention	o Prevent accidental ingestion of contaminated ground water
o Capping (Burn/Burial Area)/Point Source Runoff Diversion	o Prevent direct contact with soils; reduce leachate to ground water; eliminate erosion of contaminated soils
o Soil/Sediment Removal (N.E. of Main Entrance and East Ditch); Water Treatment/ Offsite Disposal	o Prevent direct contact with soils; eliminate erosion of contaminated soils
o Soil/Sediment Removal (Overflow Area)/Point Source Runoff Diversion/Offsite Disposal	o Prevent direct contact with soils; eliminate erosion of contaminated soils
o Surface Soil Removal/Offsite Disposal	o Prevent direct contact with soils; eliminatte erosion of contaminated soils
o Soil Removal/ Onsite Incineration	o Reduce surface soil contamination; remove source of groundwater contamination; prevent direct contact with soils
o Tanks, Concrete Pads, and Soil Removal/Offsite Disposal	o Prevent direct contact with contaminants; eliminate potential threat to ground water
o Excavation (Former Waste Water Pond)/Point Source Runoff Diversion/Offsite Disposal	o Eliminate potential threat to ground water and dermal exposure to soils
o Excavation (Burn/Burial Area)/ Point SourcE Runoff Diversion/ Offsite Disposal	o Eliminate potential threat to ground water
o Soil Removal (Spray Field)/ Offsite Disposal	o Eliminate erosion of contaminated soil; prevent direct contact with soils

Table 13. Technologies Retained for Final Consideration to Remediate the Tower Chemical Company Site.

- Ground Water Monitoring
- Municipal Water Supply Extention
- Individual Treatment Units
- Tanks and Concrete Pad Removal
- Point Source Runoff Diversion
- Capping - Synthetic Membrane
- Surface Regrading and Revegetation
- Surface Soil/Sediment Removal
- Ground Water Removal
- Excavation
- Water Treatment Technologies
- Soil Incineration
- Off Site Disposal

Table 15. Summary of Remedial Action Alternatives

ALTERNATIVE	COST ($1000)*	PUBLIC HEALTH CONCERNS	ENVIRONMENTAL CONCERNS	TECHNICAL CONCERNS
1. No Action - Monitoring	1000	Potential ingestion of contaminated ground water and direct contact with contaminated soil &/or leaking tanks	Impact of contaminated ground water on fauna and flora in unnamed stream	none
2. Monitoring; Municipal Water Supply Extention; Tank/Soil Removal	1,289	Potential ingestion of contaminated ground water and direct contact with contaminated soils	Same as Alternative 1	none
3. Monitoring; Ground Water Removal; Water Treatment; Individual Treatment Units; Tank/Soil Removal	4,430	Direct contact with contaminated soils	Minimal	Removal and treatment of contaminated ground water
4. Same as Alternative 3; plus: Soil/Sediment Removal (Overflow Area and Burn/Burial Area); Exploration of Burn/Burial Area; Incineration of Soils; Point Source Runoff Diversion	5,683	Minimal	Minimal	Removal and treatment of contaminated ground water

* Based on present worth analyses

Table 15 (cont.). Summary of Remedial Action Alternatives

ALTERNATIVE	COST ($1000)*	PUBLIC HEALTH CONCERNS	ENVIRONMENTAL CONCERNS	TECHNICAL CONCERNS
5. Same as Alternative 3; plus: Soil/Sediment Removal (Overflow Area); Excavation (Former Waste Water Pond); and Capping (Burn/ Burial Area)	11,210	Direct contact with contaminated soils; potential inhalation of H_2S during excavation	Minimal	Same as Alternative 3; plus long term integrity of cap; excavation below the water table
6. Same as Alternative 3; plus: Soil/Sediment Removal (Overflow Area); Excavation (Burn/Burial Area); Excavation (Former Waste Water Pond); Offsite Disposal of Soils	15,968	Potential inhalation of H_2S and/or particulates during excavation	Minimal	Removal and treatment of contaminated ground water; excavation below the water table

* Based on present worth analyses

Table 15 (cont.). Summary of Remedial Action Alternatives

ALTERNATIVE	COST ($1000)*	PUBLIC HEALTH CONCERNS	ENVIRONMENTAL CONCERNS	TECHNICAL CONCERNS
7. Same as Alternative 6; plus: Soil/ Sediment Removal (East Ditch and N.E. of Main Facility; Soil Removal and Onsite Incineration (Spray Irrigation Field)	29,126	Potential inhalation of H_2S &/or particulates during excavation; PICs during incineration	Minimal	Removal and treatment of contaminated ground water; excavation below the water table
8. Same as Alternative 6; plus: Soil/ Sediment Removal (East Ditch and N.E. of Main Facility); Off-site Soil Disposal	22,398	Potential inhalation of H_2S &/or particulates during excavation	Minimal	Removal and treatment of contaminated ground water; excavation below the water table

* Based on present worth analyses

Alternative 2 - Ground Water and Surface Water Monitoring; Alternate Water Supply - Municipal Water Supply Extention; Tanks, Concrete Pads, and Soils Removal. This alternative would include a monitoring program for ground water and surface water and the extension of the Clermont municipal water supply. Two tanks and some concrete support pads which remain from the operation of the Tower Chemical Company would also be removed. The concentrations and types of contaminants detected in ground water could pose a potential threat to nearby private water supplies. Implementation of this alternative would eliminate this problem at the site, but the contaminated ground water in the surficial aquifer would continue to remain a potential environmental problem. This option will also fail to address the threats posed by direct contact with contaminated soils. The proposed monitoring program should be implemented first.
CAPITAL COSTS: $546,000 OPERATION AND MAINTENANCE COSTS: $743,000

Alternative 3 - Ground Water and Surface Water Monitoring; Ground Water Removal (Main Facility) and Treatment; Alternate Water Supply - Individual Treatment Units; Tanks, Concrete Pad and Soil Removal. This alternative would include the monitoring program described in Alternative 1, removal and treatment of contaminated groundwater, and the installation of individual treatment units on the two private wells adjacent to or on the site. Two tanks and some concrete support pads which remain from the operation of the Tower Chemcial Company would also be removed. The removal of contaminated groundwater would eliminate the potential for migration or ingestion. The treatment units would provide a protected source of potable water for the duration of the ground water removal. The monitoring program should be implemented in conjuction with the ground water extraction system. The individual treatment units could be installed while the monitoring wells are being constructed.
CAPITAL COSTS: $3,523,000 OPERATION AND MAINTENANCE COSTS: $907,000

Alternative 4 - Ground Water and Surface Water Monitoring; Ground Water Removal and Treatment; Alternate Water Supply - Individual Treatment Units; Soil/Sediment Removal (Overflow Area); Exploration (Burn/Burial Area); Surface Soil Removal; Tanks and Soil Removal; and Tank/Soils Removal; On-Site Thermal Destruction of Contaminants in the Soils. In addition to monitoring, groundwater removal, water treatment, point source run-off diversion, removal of two process tanks, and excavation and on-site thermal destruction of soils from the overflow area, this alternative would also address the concerns surrounding the burn/ burial area. The point-source discharges from Vita-Green, Inc. would be diverted from these areas. Contaminated surface soils would be removed and exploration for buried drums in the burn/burial area would be conducted. Dewatering for excavation can be conducted simultaneously with the ground water recovery operation.
CAPITAL COSTS: $6,788,000 OPERATION AND MAINTENANCE COSTS: N/A

Alternative 5 - Ground Water and Surface Water Monitoring; Ground Water Removal and Treatment; Alternate Water Supply - Individual Treatment Units; Soil/Sediment Removal (Overflow and Burn/Burial Areas); Excavation (Former Waste Water Pond); Capping (Burn/Burial Area); Tanks/Soils Removal;

and Off-Site Disposal of Soils. In addition to monitoring, groundwater removal, water treatment, and individual treatment units under this alternative, contaminated soil would be excavated from the former wastewater pond and a cap would be installed over the burn/burial area. Also, the surface soils and sediments in the overflow area would be removed for off-site diposals. Excavation of the former wastewater pond should be implemented prior to the installation of the groundwater exctraction wells. Monitoring and groundwater removal could be implemented concurrently.
CAPITAL COSTS: $10,293,000 OPERATION AND MAINTENANCE COSTS: $971,000

Alternative 6 - Ground Water and Surface Water Monitoring; Ground Water Recovery (Main Facility) and Treatment; Alternate Water Supply - Individual Treatment Units; Soil/Sediment Removal (Overflow Area); Excavation (Former Waste Water Pond and Burn/Burial Area); Tanks, Concrete Pads, and Soil Removal; Tanks/Soils Removal. If this alternative were implemented, it would be identical to Alternative #3 except that the burn/burial area would be excavated and the two tanks, concrete pads, and soils would be removed. These actions could be performed in conjunction with the excavation of the former wastewater pond.
CAPITAL COSTS: $15,440,000 OPERATION AND MAINTENANCE COSTS: $1,367,000

Alternative 7 - Ground Water and Surface Water Monitoring; Ground Water Removal (Main Facility) and Treatment; Alternate Water Supply - Individual Treatment Units; Soil Sediment Removal (Overflow Area); Excavation (Former Waste Water Pond and Burn/Burial Area); Tanks, Concrete Pad, and Soil Removal; Point Source Run-Off Diversion; Surface Soil/Sediment Removal (East Ditch and Northeast of Main Entrance); Soil Removal (Sprayfield) and Soil Treatment Incineration. This alternative would be similar to Alternative #6, except that surface soils would be removed from the sprayfield and an area northeast of the main entrance and the sediments would be removed from the east ditch. The soils removed from the sprayfield would be incinerated on-site and the treated soil used as backfill for that area. Soil removal and soil incineration could be performed concurrently with excavation or soil removal from the overflow area.
CAPITAL COSTS: $28,219,000 OPERATION AND MAINTENANCE COSTS: $907,000

Alternative 8 - Ground Water and Surface Water Monitoring; Ground Water Removal (Main Facility) and Water Treatment; Alternate Water Supply - Individual Treatment Units; Soil/Sediment Removal (Overflow Area); Excavation (Former Wastewater Pond), Excavation (Burn/Burial Area); Tanks, Concrete Pads, and Soil Removal; Point Source Run-Off Diversion; Surface Soil/Sediment Removal (East Ditch and NE of Main Entrance); Soil Removal (Sprayfield) and Off-Site Disposal. If this alternative were implemented, it would be identical to Alternative #6 except that the sprayfield soils would be disposed of off-site.
CAPITAL COSTS: $21,491,000 OPERATION AND MAINTENANCE COSTS: $907,000

ADDITIONAL CONSIDERATIONS

Since the enactment of the Superfund Amendments and Reauthorization Act (SARA) new requirements have been enacted on the remedial response options available for use at Superfund sites. Of these enactments, one portion of the Act has imposed stringent requirements which directly impact the

selection of a viable remedy for the Tower Chemical site. This requirement (SARA Section 121 (b)) strongly opposes the selection of remedial actions which do not offer permanent solutions or which involve the disposal of hazardous waste materials in landfills.

In order to respond to the "spirit" of this amendment, EPA commissioned a study to further assess on-site soil treatment technologies. This evaluation is presented in Appendix G. A total of 9 soil treatment technologies were assessed (Table 16). Of these technologies, none were found to be acceptable based on the following aspects: effectiveness, implementability, and cost. These reasons have been previously discussed in the Technologies Eliminated portion of this section.

Table 16. Soil Treatment Technologies Assessed

- Soil Flushing/Soil Washing
- Biodegradation
- Activated Carbon
- Lime-Fly Ash Pozzolan Process
- Pozzolan-Portland Cement Process
- Thermoplastic Microencapsulation
- Macroencapsulation
- Incineration

SECTION VI
COMMUNITY RELATIONS

Community relations efforts for the Tower Chemical Company site were initiated in September 1984 when EPA completed the site Community Relations Plan. Area residents were contacted as part of the community relations work. Overall, area residents expressed concern for both health and non-health issues. However, the community interest overall, in this site has been limited.

An information repository was established at the Cooper Memorial Library, near the site. All final documents, plus the draft Remedial Investigation (RI) and draft Feasibility Study (FS) were sent to the repository to provide Public access.

In preparation for the public meeting, a fact sheet was sent to the interested parties listed in the Community Relations Plan. The fact sheet provided interested parties with a summary of all remedial alternatives being considered by EPA for remediating the problems surrounding the Tower Chemical Company site. On September 16, 1986, a public meeting was held to discuss the findings of the RI/FS. The public meeting served to initiate a 3 week public comment period which closed on October 7, 1986. Attendance at the public meeting was moderate. Several written comments were received during the public comment period. These comments have been fully addressed in the Responsiveness Summary (Appendix B), which was also placed in the information repository.

SECTION VII
CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

Other environmental laws which may be applicable or relevant to the remedial activity being proposed for the Tower Chemical Company site are:

- Safe Drinking Water Act
- The State of Florida Administrative Code (FAC); Chapter 17-3 - Surface Waters: General Criteria
- The State of Florida Administrative Code (FAC); Chapter 17-22 - Drinking Water Standards
- The State of Florida Administrative Code (FAC); Chapter 17-30 - Hazardous Waste
- EPA Ground Water Protection Strategy
- Clean Water Act (CWA)
- St. Johns Water Management District: Extraction Well Permits
- Resource Conservation and Recovery Act (RCRA)
- Executive Order 11988: Floodplain Management

Locally, residents obtain their water supplies from the Floridan Aquifer, which is poorly protected in the site vicinity due to the presence of relic sinkholes. Therefore, the mandates of the Safe Drinking Water Act apply to this site. The use of temporary water treatment units on the two private wells nearest the site will insure that the well users will have safe drinking water supplies until the aquifer can be fully restored by the ground water recovery and treatment activity. Ground water clean-up operations are consistent with the goals established in the EPA Ground Water Protection Strategy (GWPS); failure to respond to ground water contamination could threaten the local drinking water supply — the Floridan Aquifer, and would lead to degradation of the surficial aquifer. Also, the GWPS seeks further to protect environmentally sensitive areas such as the nearby wetlands.

The recovered ground water would be treated before being discharged to the unnamed stream north of the site. The discharge of this treated water will be conducted in accordance with the requirements of the Clean Water Act, and in accordance with the requirements of surface water criteria specified in the Florida Administrative Code Chapter 17-3.061.3(m).

The ground water recovery operations will comply with the substantive requirements which the St. Johns Water Management District may decide to impose on ground water extraction wells through their permitting process.

The proposed remedy will eliminate all threats arising from the Tower Chemical Company operations. As a result, there will be no requirements under RCRA for long term site monitoring.

Surface waters are not now being adversely impacted by the Tower Chemical Company site, however, failure to address ground water contamination will

ultimately result in the discharge of contaminated ground water into the unnamed creek north of the site. Therefore, ground water recovery and treatment operations are necessary to prevent eventual violation of the Florida Administrative Code Chapter 17-3.061.3(m).

Destruction of the contaminated soils by incineration will have to meet the requirements of Parts 264(o) and 261 Appendix 2 of RCRA, along with Chapter 17-30 of the Florida Administrative Code. RCRA Part 264(o) governs all aspects of incinerator test burns, and RCRA Part 261 Appendix 2 governs the EP Toxicity requirements for disposals of incinerator ash. The State of Florida requirements governing incineration (FAC 17-30) adopts RCRA Part 264(o) without further state-imposed regulations. Therefore, incineration activities must be conducted in accordance with the applicable portions of RCRA.

The soil and ground water clean-up criteria (Appendix D) were jointly established by EPA and FDER, based on the Superfund Public Health Evaluation Manual.

The Natural Resource Damage Assessment conducted by the Department of the Interior concluded that the operations of the Tower Chemical Company site may have impacted federally protected trustee resources (Appendix E). There are no wetlands currently being threatened by the site, nor will the remedial action being proposed for this site create such a threat; however, failure to take remedial action at this site will eventually cause the contaminants to invade all parts of the local ecosystem. The site is above the 500-year floodplain (Figure 25).

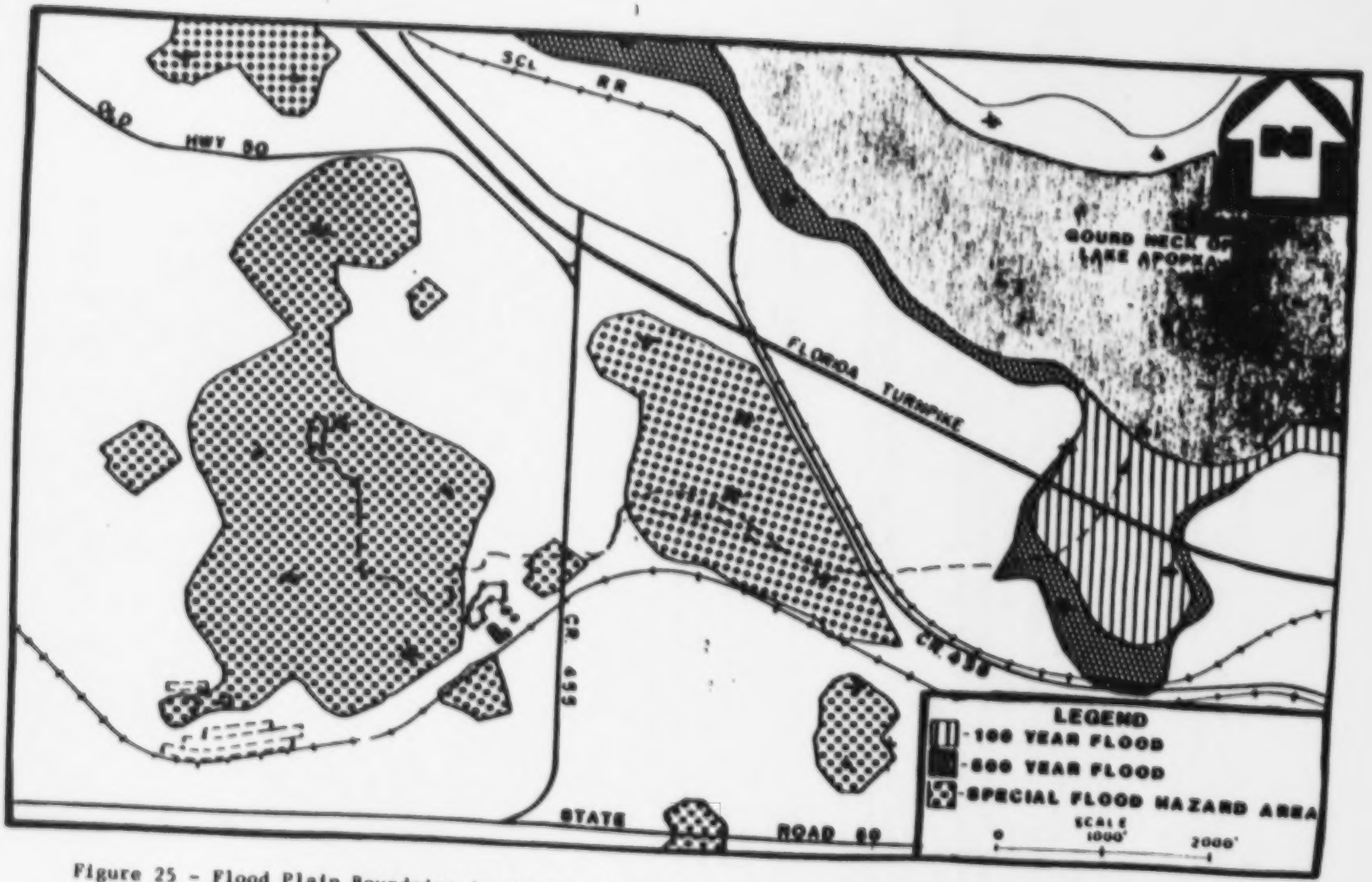

Figure 25 - Flood Plain Boundries in the Vicinity of the Tower Chemical Company Site.

SECTION VIII
RECOMMENDED ALTERNATIVE

SELECTED REMEDY

The recommended alternative for the Tower Chemical Company site consists of removal and treatment of contaminated ground water, provision of individual treatment units for two private wells in the immediate site vicinity, removal and incineration of contaminated surface soils from both the overflow area and portions of the burn/burial area of the site, pilot excavation of the burn/burial area to determine the composition of the magnetic anomaly, removal of the two tanks, concrete pads, and contaminated soils, and point source run-off diversion. This is Alternative 4, as outlined in Section V of this document.

The ground water recovery operation will require the removal of approximately 100,000,000 gallons of contaminated water from under the site. The recovered ground water will be treated by a combination of flow equalization, chromium reduction, precipitation, filtration, and activated carbon processes in an on-site treatment facility as illustrated in Figure 26. Surface water discharge of the treated water will be the disposal method used for this site. The ground water will be recovered until sampling efforts indicate that the criteria presented in Table 17 are achieved, as fully as is possible given the current state-of-the-art analytical capabilities. Prior to discharge of the treated effluent to the surface water system, samples will be collected to confirm that the effluent meets the clean-up criteria. The ground water recovery operations will also serve to "flush out" mobile compounds which remain buried at depth below the former wastewater pond.

Subsequently, a complete HSL scan will be performed to determine if there are any remaining priority pollutants in elevated concentrations which should be addressed. Since primary and secondary drinking water standards cover only a small percentage of parameters on the list, all detected priority pollutants will be considered in evaluating whether further groundwater recovery and treatment will be necessary. The appropriate flow rate and effective concentration limits will be evaluated and determined during the Remedial Design phase so that the surface water criteria specified in Section 17-3 of the Florida Administrative Code are not violated. This will provide assurance that surface water disposal of the treated ground water will not adversely impact the environment of the unnamed stream or Lake Apopka.

Individual water treatment units will be provided for two private wells in the site vicinity to prevent potential exposure to ground water contaminants should the contaminants migrate into the Floridan Aquifer prior to completion of the groundwater recovery action. The treatment units will be installed on the private water supply well being used by employees of the Vita-Green Company, whose water supply well is on the site property and to the well owned by Mr. Charles Hubbard, who is located immediately adjacent to the site and whose water supply well is down gradient from the contaminant plume. The individual treatment units will

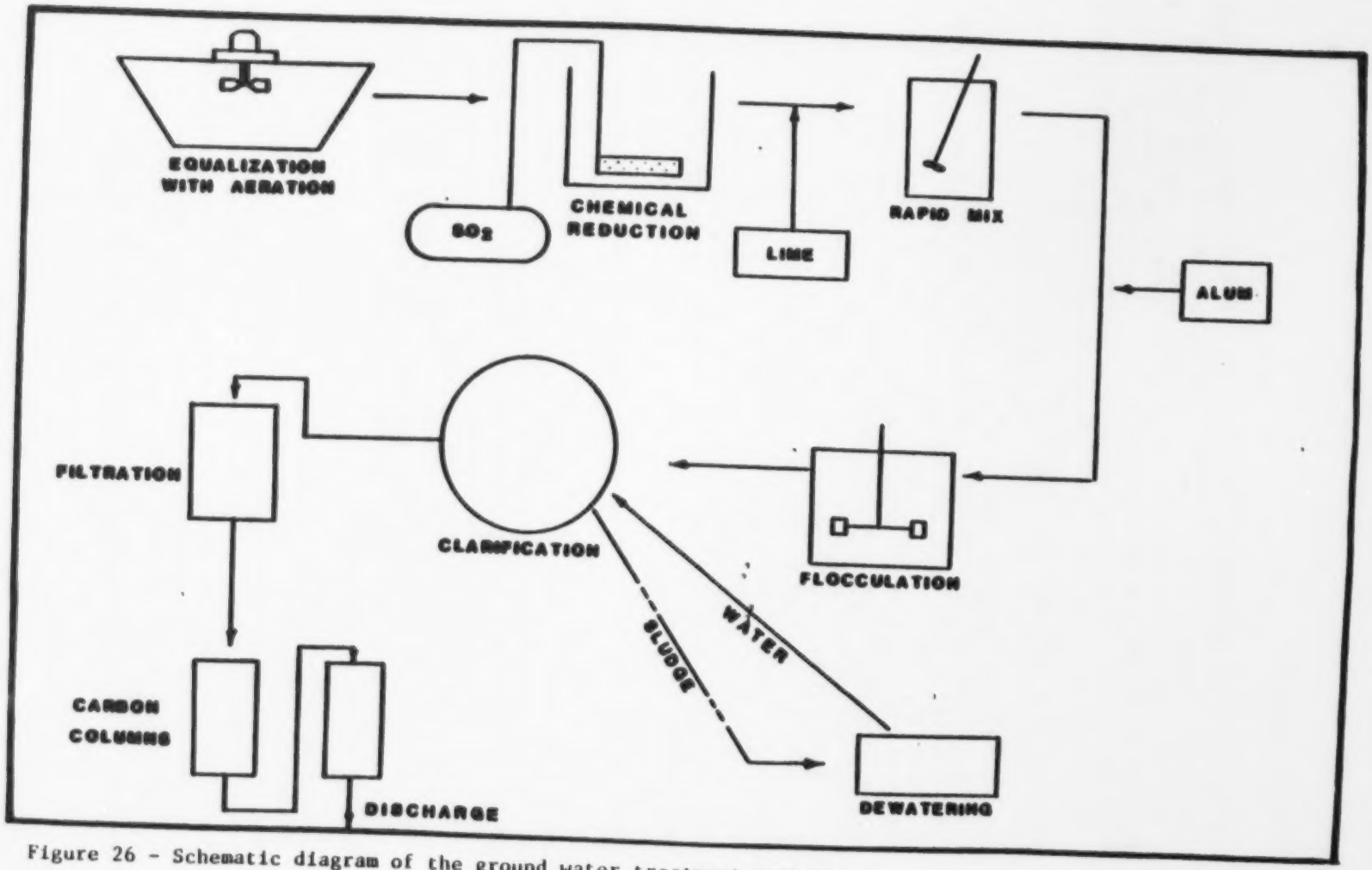

Figure 26 - Schematic diagram of the ground water treatment system.

Table 17. Target Clean-up Levels for Ground Water Contamination at the Tower Chemical Company Site

Indicator Chemical	Florida Ground Water Standard (ug/l)	Maximum Observed Concentration (ug/l)	Target Clean-up Level (ug/l)	Source
Arsenic	50	2,000	0.05	FAC
Nickel	NA	550	350	HA
Chromium	50	1,100	0.05	FAC
Alpha-BHC	NA	0.21	0.05	MDL
Chloroform	NA	2,000	5	MDL
DDT	NA	ND	0.01	CAG
Chlorobenzilate	NA	40	1.0	ACL
Dicofol	NA	700	1.0	ACL

MCL = Maximum Contaminant Levels set by SDWA
HA = Office of Drinking Water Health Advisory
MDL = Minimum detection limit established for the Contract Laboratory Program (CLP); provided for compounds which have 10^{-6} health based criteria below detection levels
NA = No numerical standard exists
FAC = Florida Administrative Code Chapter 17-3; Surface Water: General Criteria
ACL = Alternate Concentration Limit calculated by the Region IV Regional Expert Toxicologist; based on 10^{-6} health risk levels

Table 18. Target Clean-up Levels for Soil Contamination at the Tower Chemical Company Site. Based on 10^{-6} human health risks.

Indicator Chemical	Maximum Observed Concentration (mg/kg)	Target Clean-up Level (mg/kg)
Copper	800	100
Lead	600	100
Arsenic	8.4	5
DDT	37	35

become obsolete once the groundwater recovery operation reaches the specified clean-up goals.

Surface soil removal will occur in the overflow area of the former waste water pond, in portions of the the burn/burial area, and in the storage tank area where the Cop-o-Cide contaminated soils are found. Removal will continue until the soil clean-up criteria listed in Table 18 are reached. It is expected that approximately 4000 cubic yards of soils are contaminated in excess of these clean-up criteria. After completion of the excavation, a confirmation soil sampling action will be conducted to confirm the success of the removal operation.

Contaminated soils will be treated on-site by thermal destruction of the contaminants. The remedial design phase will include a test burn to determine optimum operating efficiencies for the thermal destruction unit and to determine the fate of the residuals. If the untreated residuals can meet the RCRA de-listing requirements for hazardous wastes, the residuals will be backfilled on-site. Conversely, if the untreated residuals fail to meet the RCRA de-listing requirements, an appropriate treatment technology will be selected and applied to the residual materials.

Pilot excavation of the burn/burial area will be conducted in order to confirm or negate anecdotal information that additional buried drums are located in that area. The excavation plan developed during the Remedial Design will provide for proper destruction of any drum contents which may be found during this activity using the same thermal destruction unit being utilized for soil clean-up.

Point source run-off diversion will be designed to address the run-off emanating from the main building roof and Vita-Green washdown waters which now traverse the overflow area which are generated when the main building floor is rinsed off. These waters will be diverted towards the unnamed stream. This activity will reduce the potential for erosion of the site soils. Revegetation and regrading of the overflow area, tank spillage area, and the burn/burial area will also be considered as a necessary part of this activity to minimize future erosion.

The two storage tanks which are left over from the Tower Chemical Company operations and nearby concrete pads will be decontaminated on-site. The decontaminate tanks will be recycled, and the decontaminated concrete pads will be backfilled on-site. The first storage tank is located at the northernmost corner of the main building and is in a vertical position. The second storage tank is located west of the burn/burial area and is in a horizontal position. The concrete pads are along the northwestern wall of the main building.

Since this remedy will remove all contaminants of concern from the site to levels below the established clean-up criteria, it will not be necessary to undergo long term monitoring of the ground water or the surface water. Monitoring efforts will be limited to confirm the success of the remedial action and to assess the impact that implementation of the proposed remedy has on the surrounding area during the period of implementation.

The selected remedy is expected to cost approximately 6.8 million dollars. The State of Florida has instituted a program for addressing the problems posed by uncontrolled hazardous waste site. This program is designed on the CERCLA model and is operated similarly to Superfund through the Florida Department of Environmental Regulation. The State of Florida has agreed to fund 10% of the cost for implementing the selected remedial action (Appendix I). A summary of the cost estimate for the proposed remedy is presented in Appendix J.

Table 19 shows all alternatives evaluated fully for this site and the basis on which each alternative is rejected.

STATEMENT OF COMPLIANCE WITH SECTION 121 OF SARA

The remedy proposed for the Tower Chemical Company site is the most effective alternative in terms of removing the threats posed by the site, and is considered the most effective choice given the current state of clean-up technologies. This remedy is a cost-effective remedy which achieves a 10^{-6} public health protection level and will remove the threats this site poses to the environment. The remedy will provide protection which will meet all applicable, relevant, and appropriate requirements, and is cost-effective. Finally, the remedy utilizes permanent treatment technologies to the maximum extent practicable. "

Table 19. Summary Table of Feasible Alternatives and Cost Comparison. Costs Presented in Millions of Dollars.

Alternative	Alternative Components																Reason for Non-Selection	Cost
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1	X	X															Does not provide adequate protection for public health or the environment. Relative risk is 1×10^{-1}.	0.84
2		X	X			X											Fails to prevent migration of contaminated ground water into the surface water regime. Fails to provide sufficient protection for public health. Relative risk is 8×10^{-3}.	0.94
3		X		X	X	X											Fails to address soils contamination which leaves risk from dermal exposure. Fails to provide sufficient protection for public health. Relative risk is 1×10^{-5}.	4.29

KEY
1-No Action
2-Monitoring
3-Municipal Water Supply Extention
4-Ground Water Removal & Treatment
5-Individual Water Treatment Units
6-Removal of Tanks, Concrete Pads & Associated Soils
7-Soil/Sediment Removal - Overflow Area
8-Soil/Sediment Removal - East Ditch and NE of Main Entrance
9-Soil Removal - Spray Irrigation Field & Incineration
10-Surface Soil Removal - Burn/Burial Area
11-Excavation - Spray Field Area
12-Capping - Burn/Burial Area
13-Excavation - Burn/Burial Area
14 Excavation - Former Waste Water Pond
15-Off-Site Disposals
16-Point Source Runoff Diversion

Table 19 (cont.). Summary Table of Feasible Alternatives and Cost Comparison. Costs Presented in Millions of Dollars.

Alternative	Alternative Components																Reason for Non-Selection	Cost
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
4		X		X	X	X	X			X					X	X	Relative risk is 2×10^{-6}.	5.39
5		X		X	X		X					X		X	X		Unnecessary excavation activity required. Relative risk is 1×10^{-5}	10.91
6		X		X	X	X	X						X	X	X		Unecessary excavation required based on clean-up goals. Relative risk is 2×10^{-6}	15.97
7		X		X	X	X	X	X	X				X	X	X		Unnecessary excavation required based on clean-up goals. Expensive. Relative risk is 1×10^{-8}	28.56

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11-Excavation - Spray Field
12-Capping - Burn/Burial Area
13-Excavation - Burn/Burial Area
14-Excavation - Former Waste Water Pond
15-Off-Site Disposal
16-Point Source Runoff Diversion

Table 19 (cont.). Summary Table of Feasible Alternatives and Cost Comparison. Costs Presented in Millions of Dollars.

Alternative	Alternative Components																Reason for Non-Selection	Cost
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
8		X		X	X	X	X	X			X		X	X			Unnecessary excavation activity required. Expensive. Relative Risk is 1×10^{-8}	22.19

KEY 1-No Action
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15-Off-Site Disposal
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SECTION IX
OPERATIONS AND MAINTENANCE

Operations and maintenance considerations for the selected remedy at the Tower Chemical Company site will be limited. There will be no long term monitoring related to the soils contamination since all soils which exceed the clean-up criteria will be removed from the site. Once the ground water removal operations are complete there will be no long term monitoring required to monitor the groundwater quality. The ground water removal operation will be permanently effective since there will no longer be any soils to recontaminate the surficial aquifer or the Floridan Aquifer. However, it is expected that any groundwater removal action is expected to take an extended period of time depending on the design of the ground water recovery system.

It will be necessary to maintain the groundwater recovery system until the removal operations are complete, but this will be part of an ongoing remedial response. Under Section 121 of SARA, groundwater recovery activities are considered part of the Remedial Action for the first 10 years of operation or until the groundwater recovery operation is complete, whichever occurs first.

EPA will provide O&M, if it later becomes necessary, for a period of one year, after which the State of Florida will assume responsibility for the site.

SECTION X
PROJECT SCHEDULE

The schedule for the RD/RA phases of the Tower Chemical Company site remediation are dependent on the success of enforcement negotiations. If the PRPs agree to undertake RD/RA, the schedule will be negotiated to accomodate EPA, FDER, and the PRPS.

However, if negotiations with the PRP are unsucessful, EPA will follow the schedule outline below:

Schedule Landmark	Date for Implementation
1. Finalization of the ROD	06/30/87
2. Complete Enforcement Negotiations	08/15/87
3. Initiate Design	09/01/87
4. Complete Design	06/01/88
5. Award/Amend Superfund State Contract (and IAG) for Construction	07/01/88
6. Initiate Construction	07/15/88
7. Initiate Groundwater Recovery Operation	07/15/88
8. Complete Construction	07/15/90
9. Complete Groundwater Recovery Operation	07/15/93

SECTION XI
FUTURE ACTIONS

Successful implementation of the selected remedy will ultimately remove the Tower Chemical Company site from under the jurisdiction of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and as amended by the Superfund Amendments and Reauthorization Act (SARA). Implementation of the selected remedy will provide a permanent solution to the problems surrounding this site and will require no subsequent actions under CERCLA or SARA.

It will be necessary to confirm the efficency of the groundwater recovery system to insure that the concentration levels of mobile compounds in the contaminated soils are being reduced to levels of no concern. The estimated time to remove all currently existing contaminated groundwater is 4 years after initiation of the groundwater recovery system.

At the time that the groundwater recovery operation is completed, it will be necessary to analyze the residual contaminant concentrations which will remain in the buried sediments below the former waste water ponds. The groundwater regime will be allowed to re-equilibrate for two years after completion of the groundwater recovery operation. After two years, the groundwater in the vicinity of the former waste water pond will be resampled to identify the impacts, if any, which the residual soil contamination will have on the groundwater environment.